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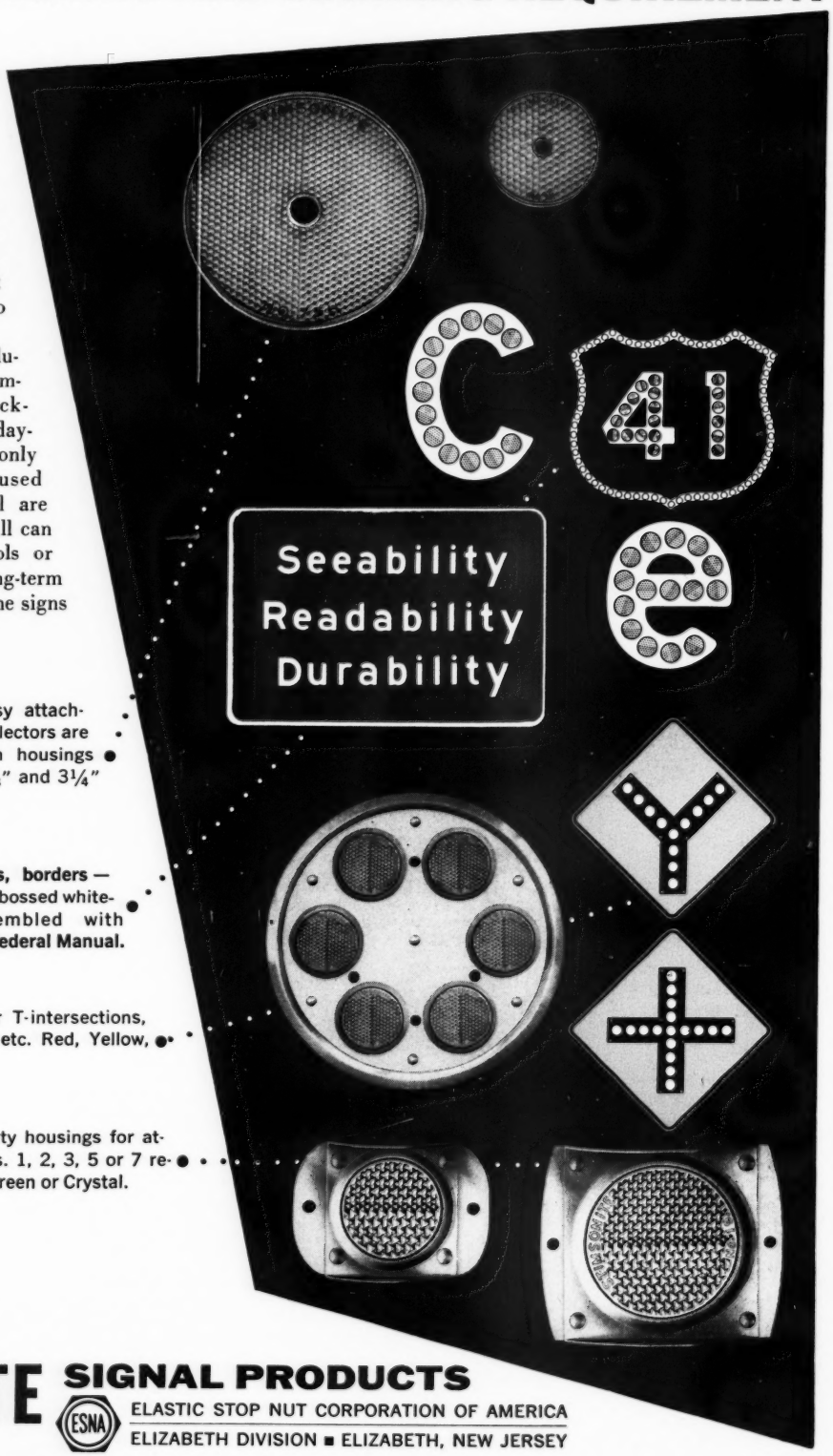


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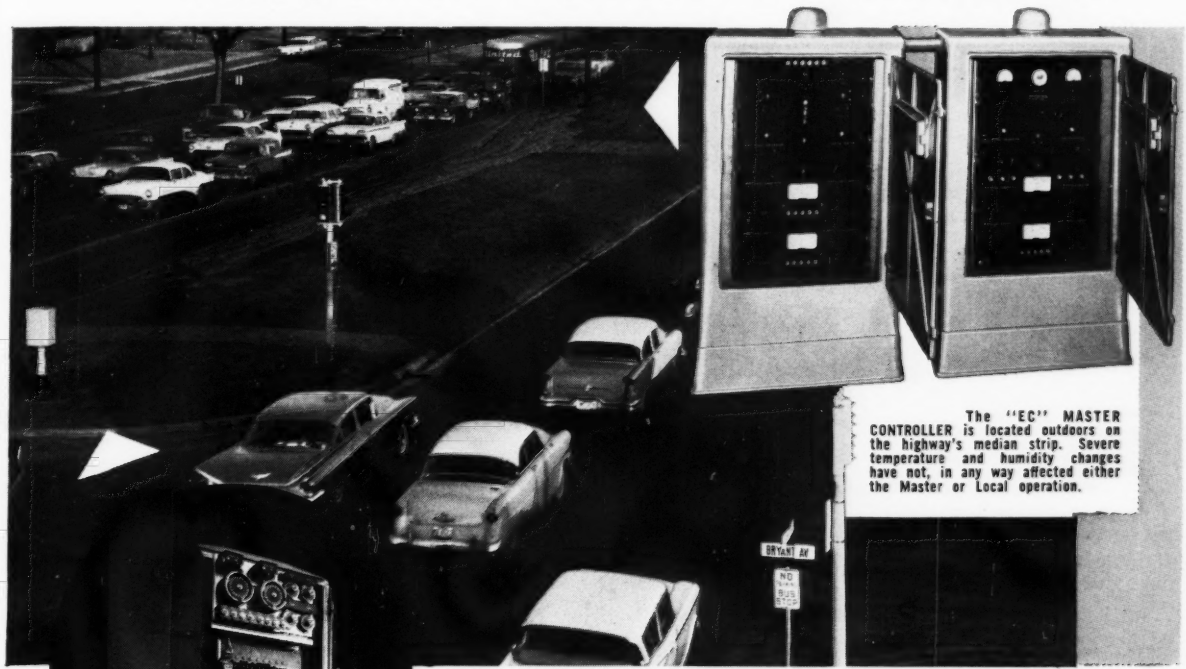


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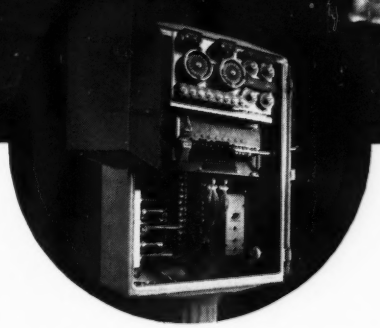

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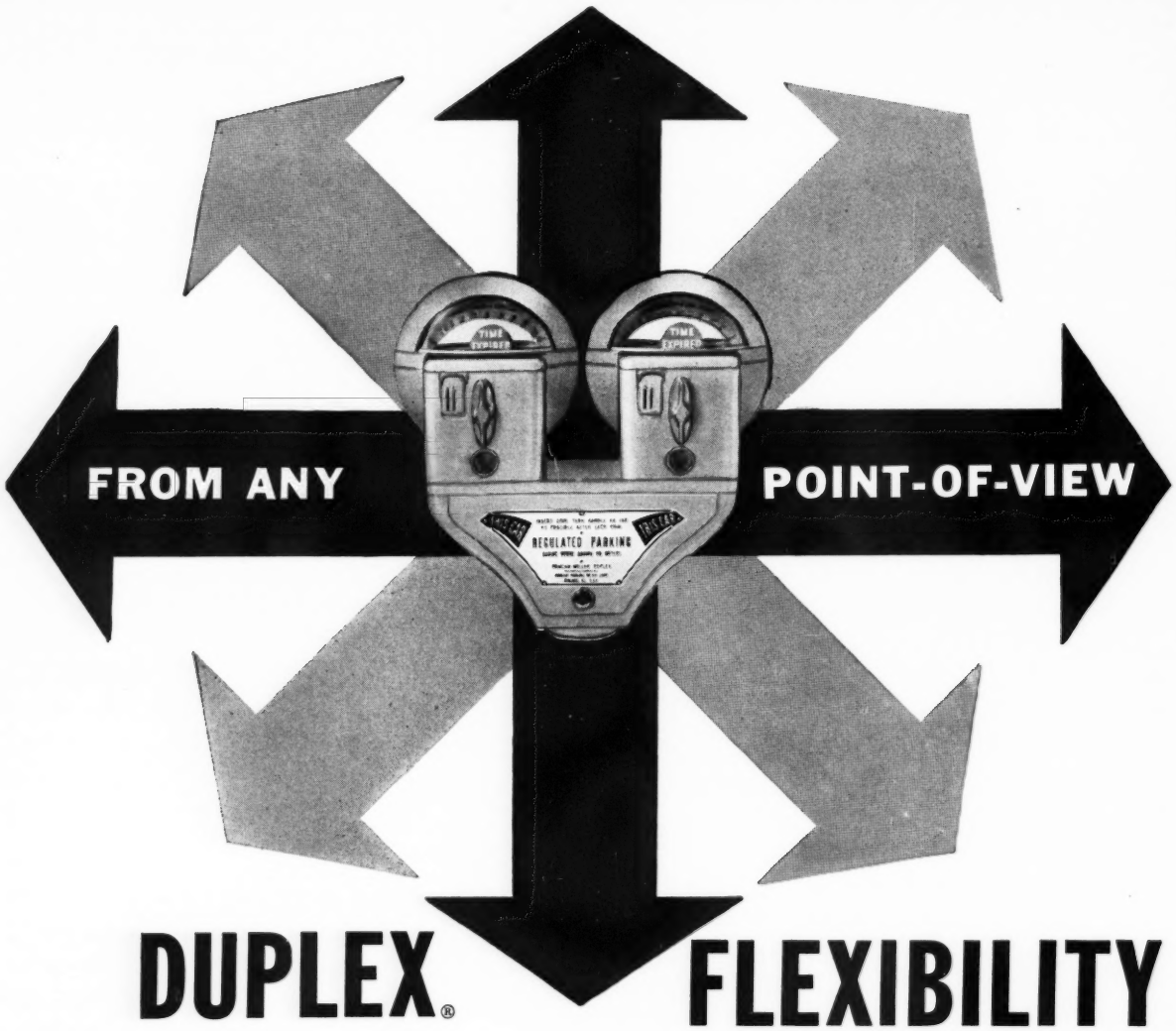


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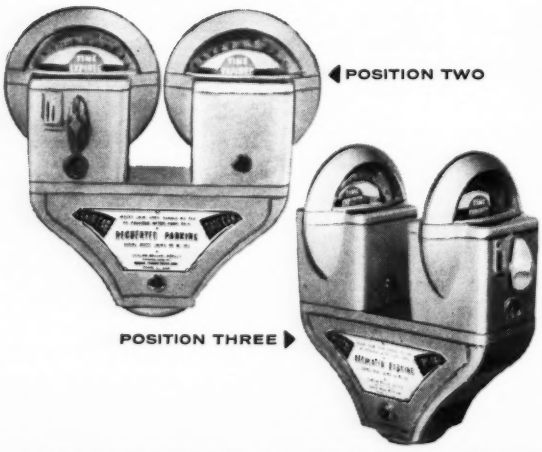


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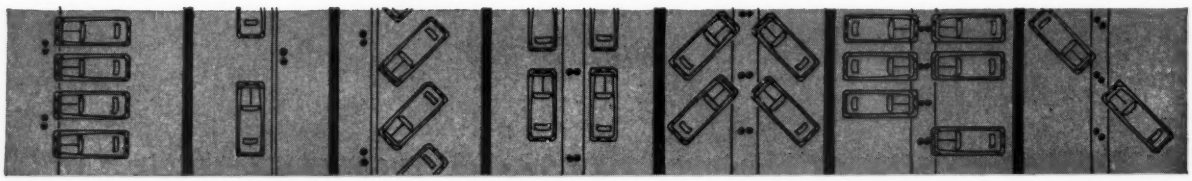

# TRAFFIC ENGINEERING

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**Cover:** Two 262 ft. plate girders — thought to be the longest ever erected in one piece — are placed on piers for the Route 422 By-Pass over the Schuylkill River near Reading, Pa. High strength bolts were used to field splice the three sections of the 98-ton girder before erection. This operation required a temporary steel bridge to "cradle" the girder (shown just above the water).

Photo courtesy of American Institute of Steel Construction, Inc.

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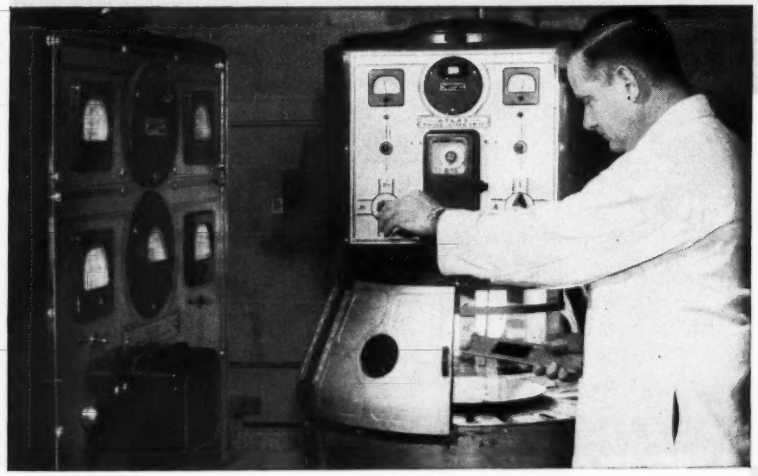

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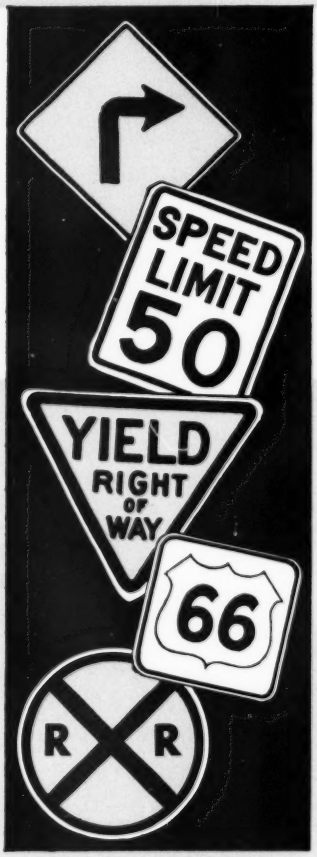


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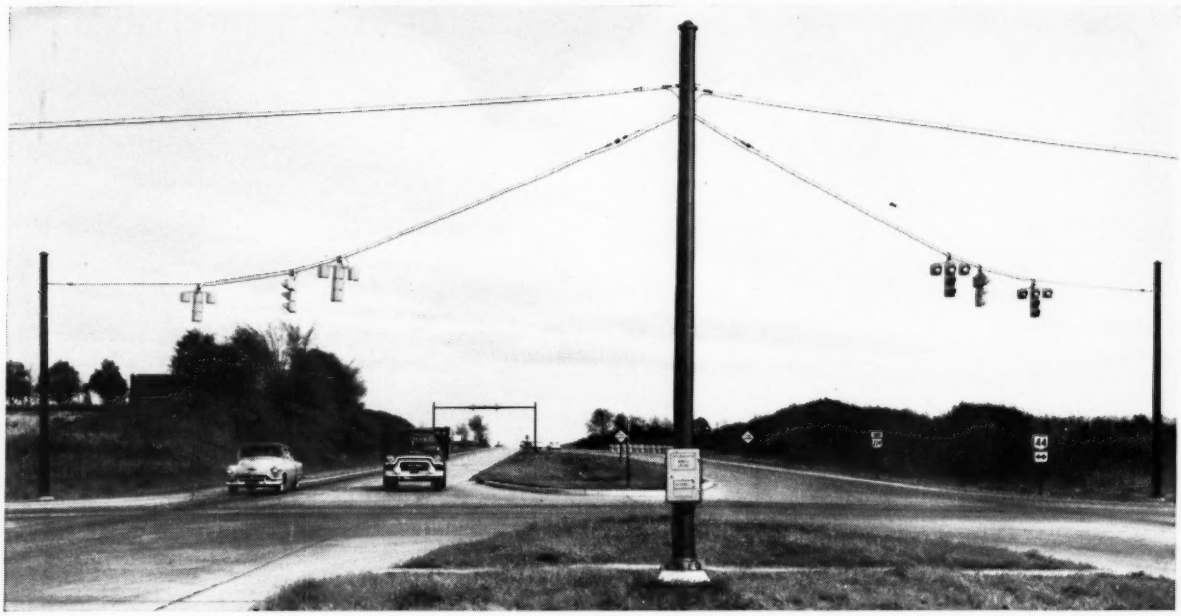
OCTOBER 1 THROUGH 7 has been set aside as National Public Works Week. It has been designated as a time to honor and give due recognition to the men in public works who, through balanced, comprehensive and coordinated planning, are facing and overcoming many of the problems of urban growth and development to make our communities better and safer places in which to live.

It is indeed appropriate for the Institute of Traffic Engineers to join in the observance of National Public Works Week. Many members of the Institute are public works officials and all members of the Institute engaged in traffic engineering are indeed working in one facet of the broad public works field. It may be appropriate, therefore, to review at this time the relationship between the fields of traffic engineering and public works.

The growing and complex urban transportation problem which has developed over the past thirty years and the need for specialized attention for this public works problem has brought about the administrative separation of traffic engineering and public works. With the continuing rapid growth of urban areas, the need for imaginative transportation planning continues and becomes more apparent. Comprehensive and effective urban transportation planning, however, cannot be developed by the traffic engineer alone. The city planner and the public works official have a vital interest in the transportation plan and the traffic engineer must join with these officials to form a co-operative administrative team which will be responsible for developing the framework upon which the urban area will develop and prosper. The members of this team, working together, will review the past, examine the present and look into the future and there will evolve an urban plan which can be presented to the elected official and the citizen as a reasonable and necessary program of action and progress. Urban transportation is only one facet of this program, but it does provide the basic framework upon which all urban needs can properly be placed. If formal co-operative action is not provided for either by charter provision or administrative directive, the traffic engineer and the public works official have a mutual responsibility for establishing an effective relationship.

Traffic engineers are urged to join in the recognition of National Public Works Week and to strengthen the ties with our fellow engineers in the public works field.

EUGENE MAIER
Director, Department of Public Works
Houston, Texas



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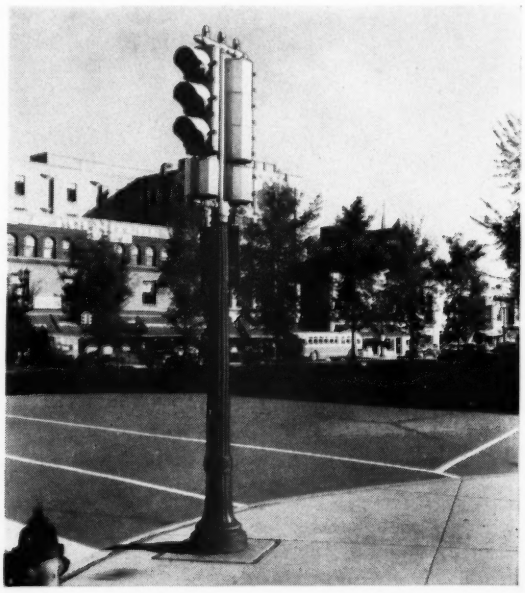

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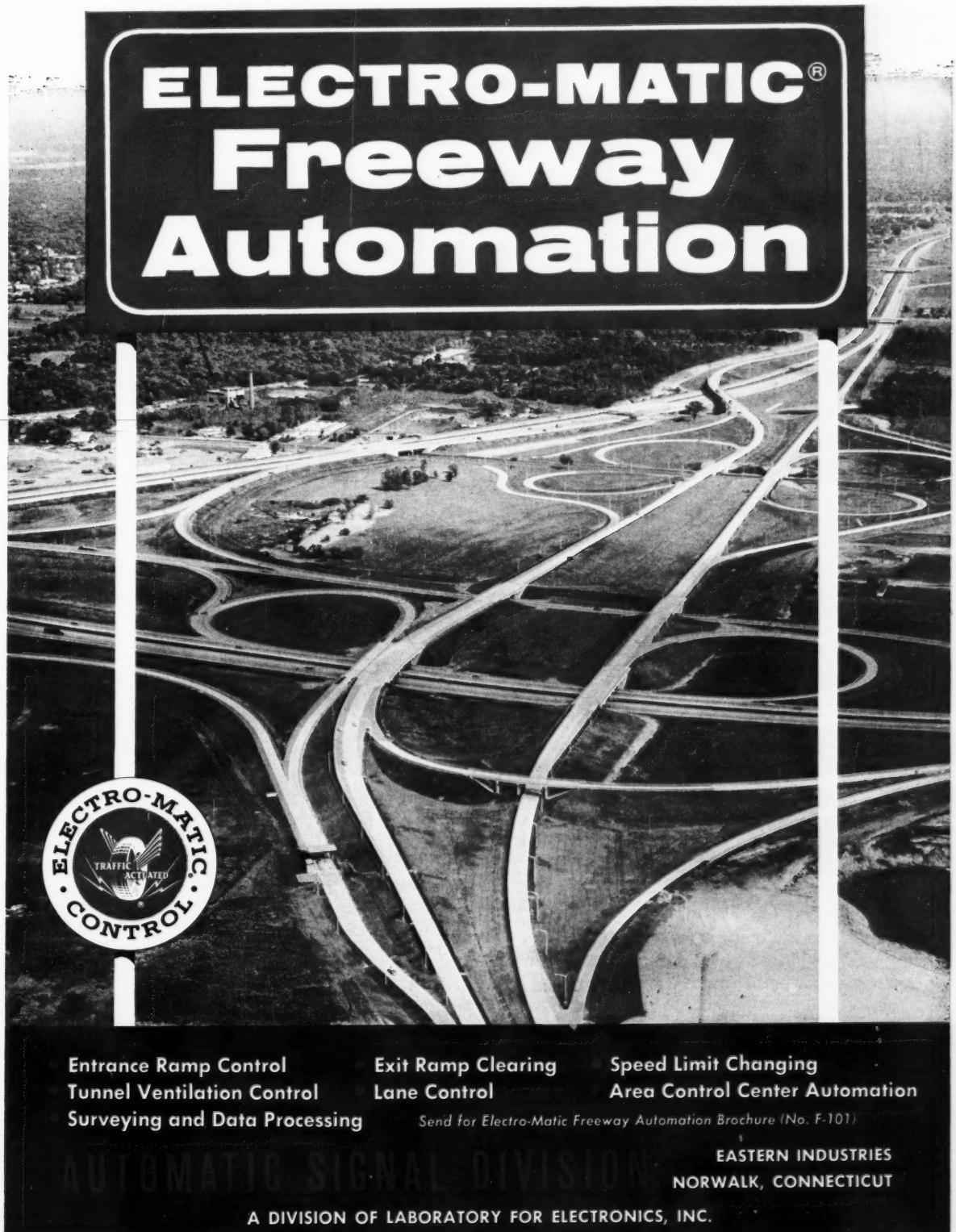


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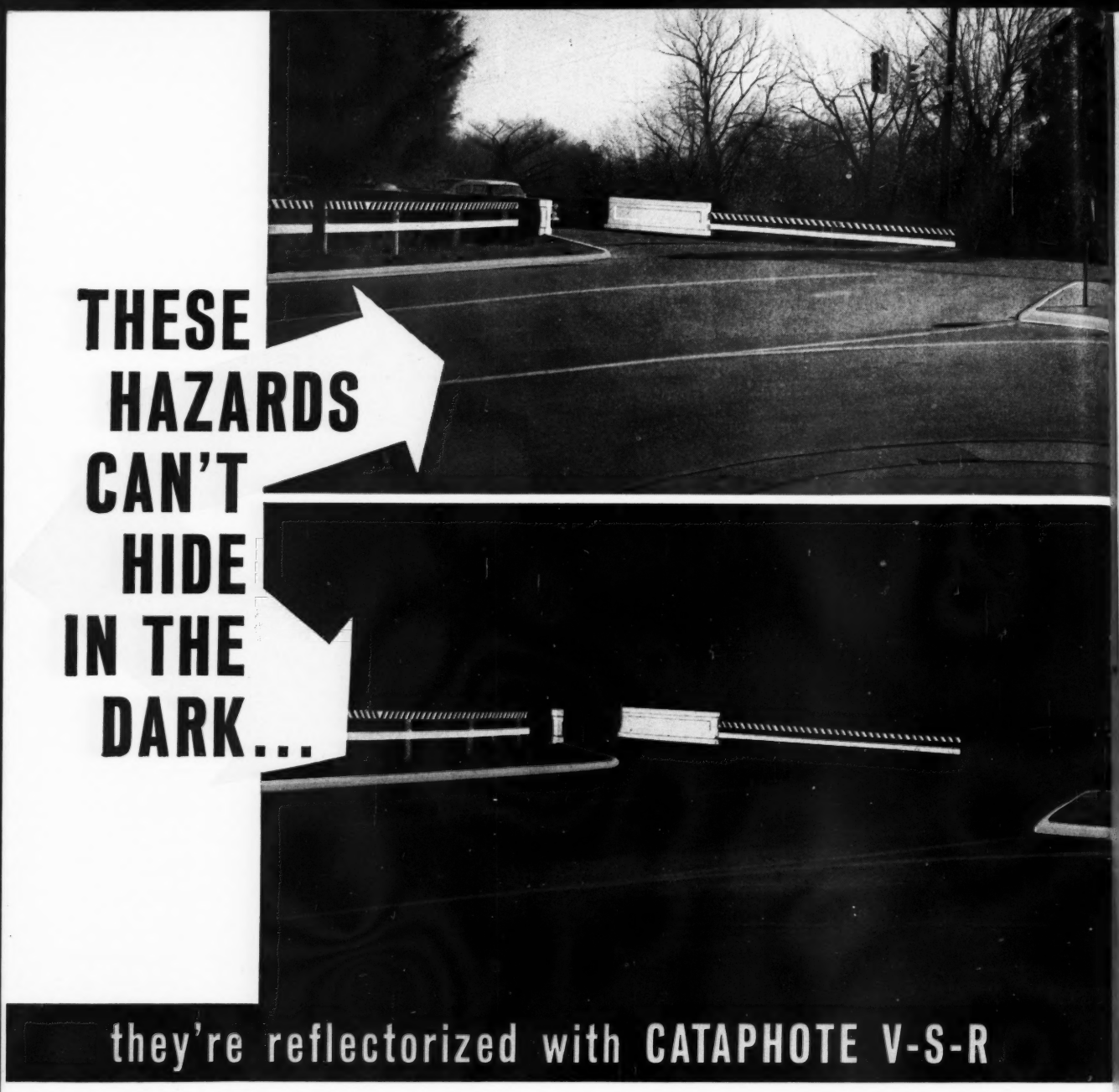

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# Driver Tension and Rural Intersection Illumination

By Donald E. Cleveland
Assistant Research Engineer
Texas Transportation Institute
and
Assistant Professor
Agricultural and Mechanical College
of Texas

THE TRAFFIC ENGINEER must concern himself with night traffic operations since the night accident rate is approximately double the day experience. The constantly increasing traffic volumes emphasize the importance of this problem as more and more people and goods move after dark. Though the personal characteristics and motivations of these night road users pose formidable educational and enforcement problems, it is the vision problems associated with darkness that most concern the engineer. He strives to design and equip his facilities with devices that provide for the special problem of seeing after dark. One of his most important tools is highway illumination.

Highway intersections are the most critical points in our road systems. The potential reduction in accident experience at these centers of conflict, along with increased usage and comfort, have stimulated much interest and experimentation on the proper design of illumination of highway intersections. The Texas Transportation Institute is conducting an intensive study of some of the problems associated with the illumination of intersections. The objective of the study is to determine the effects of various types of intersectional illumination and signing on safety, comfort, and operational characteristics.

It is generally agreed that illumination decreases intersectional accidents by providing improved visibility and warning of danger, and increased confidence and comfort. The actual optimum design of such illumination however is not generally agreed upon. Currently accepted techniques are being changed as more complete knowledge of the problem becomes available.

Current techniques of evaluating illumination designs are not completely satisfactory. The analysis of accident experience is complicated by having to wait for long periods to overcome the effect of natural variability in accident experience, during which time many other conditions frequently change. Accident studies have not produced results adequate for use in the comparison of details of illumination design. Illumination does not produce a marked effect on traffic operations. Unpublished Texas Transportation Institute studies and the recent work of Taragin and Rudy[12] show that speed, headway, and placement, the most significant moving characteristics, are little different under illuminated or nonilluminated conditions. Photometric approaches based on relating measurable illumination characteristics to specific vision tasks on the highway are still in a state of development.

Despite these somewhat discouraging results all of us have experienced the satisfaction of operating on well illuminated highways and many believe that there must be some way of expressing this satisfaction quantitatively in such a manner that it can aid us in design when our own senses or preconceptions allow us to no longer discriminate between alternate designs.

There has been relatively little research on driver comfort related to the level of illumination. That driver comfort and convenience is the *primary* objective of highway design has often been expressed in recent years. Deputy Commissioner Barnett of the Bureau of Public Roads has been quoted by Rex[11] as follows:

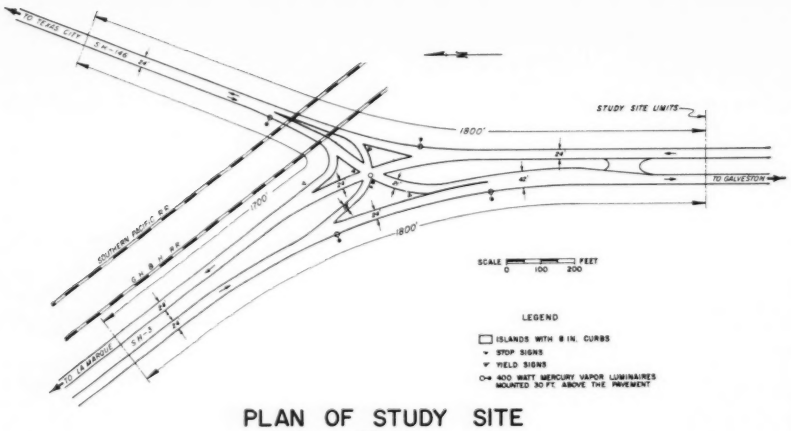
> "Intangible benefits (of illumination) are . . . greater comfort in driving . . ."

Unfortunately, comfort is practically undefinable as a practical measurable criterion and any attempts to measure driver satisfactions must recognize this difficulty.

## Galvanic Skin Response

In seeking a measure of the effect of illumination on driver reactions it was believed that the tension resulting from the complex decisions required at intersections after dark might be measurable. Psychologists have developed a number of measures of behavior that can be used to measure tension response. A tool measuring tension and relating it to the driving environment would be of great value. The galvanic skin reflex is the physiological measure most nearly fulfilling these requirements.

The galvanic skin reflex (GSR), or change in electrical skin resistance, has been much studied since Feré discovered in 1888 that a galvanometer fed by a weak current and connected in series with a subject with electrodes attached to the forearms deflected quickly when the subject was stimulated by the sight of colored glass, the sound of a struck tuning fork, or by an odor. The response can be initiated by unexpected stimuli that may be startling or tension inducing and is induced by activity of the autonomic nervous system[10]. The GSR appears as a decrease in resistance or increase in conductance with a magnitude proportional to the intensity of the inducing stimuli[4]. Aveling indicates that a GSR occurs when conation or the act of striving is experienced[1]. According to McCurdy the GSR is a sensitive indicator of mental functions and is associated with the subject's conscious experiences[9]. Lindsley states that the GSR is particularly sensitive to sensory and ideational stimuli, especially those associated with alertness, attention, apprehension, and arousal[8]. The GSR, he




PLAN OF STUDY SITE
FIGURE 1

adds, is perhaps a more sensitive index of higher level mental functions than any other indicator of bodily change.

There have been two recent investigations of the possibility of using the GSR in the traffic engineering field. Hulbert found that a GSR resulted when other traffic forced the test driver's vehicle to alter its normal unimpeded path[5]. Michael's urban street studies identified dynamic vehicular conflicts as being more stress inducing than fixed object conflicts[10]. Michaels also identified a difference in the tension producing characteristics of two routes with dissimilar design and operational characteristics.

## Purpose and Scope of Study

It was believed that a carefully controlled GSR experiment might indicate a different tension response to intersection illumination than to the unlit condition, and if so the GSR could be a useful tool to determine illumination design criteria. Accordingly, the general purpose of this study was to explore and evaluate the possibility of using the GSR to measure the effect of illumination on driver tension.

The scope of the study was limited to consideration of a single rural intersection suitable for experimental lighting studies, a comparison between no illumination and a minimum amount of intersectional illumination, a comparison among several young drivers, and a comparison of a limited number of intersectional geometrics and traffic control devices. Only that part of total tension related to the highway itself was considered, eliminating the tension response caused by other traffic.

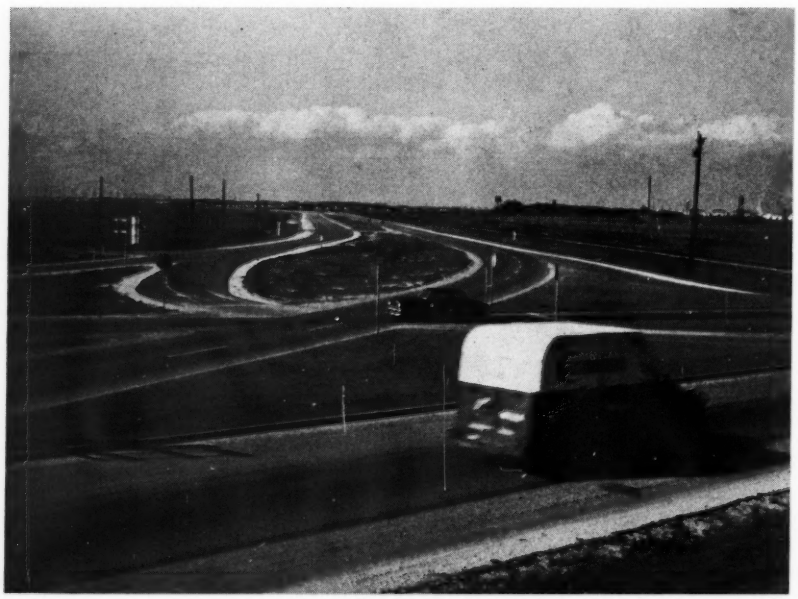


Figure 2

## Conclusions

The results of the study indicate that the GSR can be used by carefully trained personnel and by selected observers to produce consistent statistically significant results with a small number of observations. The GSR discriminates between conditions of illumination, producing only 80% as many tension responses under illuminated conditions as when there is no light at the test intersection. This effect is consistent for the different drivers tested. The more difficult and complex paths through the intersection generate more tension responses. The GSR appears to detect the improvement in visibility resulting from illuminating the intersection.

## Study Site

The study was conducted at a Y-type rural intersection located at the junction of two Texas state highways approximately forty miles from Houston. A schematic layout of the study site is shown in Figure 1 and a photograph of the intersection is shown in Figure 2. In the vicinity of the intersection State Highway 3 is a bituminous surfaced four-lane divided facility, while State Highway 146 is a two-lane portland cement concrete roadway. Speed limits on the two highways are 55 and 45 miles per hour respectively. Both highways have little gradient and are tangent for more than 0.5 mile in each direction from the intersection. The area near the intersection is relatively undeveloped and there are few other bright light sources in the vicinity of the intersection or on the skyline.

This intersection is one of several being studied in the Texas Transportation Institute intersection illumination research project mentioned earlier. Illumination specialists, using a 1:60 scale model of this intersection determined that five 400-watt mercury vapor luminaires mounted thirty feet above the pavement at the locations shown in Figure 1 could possibly provide a minimum level of illumination for this lightly traveled intersection, and these luminaires were installed at the intersection.

## Field Studies

The four male drivers used in this study were all civil engineering students at the Agricultural and Mechanical College of Texas. Their ages ranged from 21 to 28 years and all had had

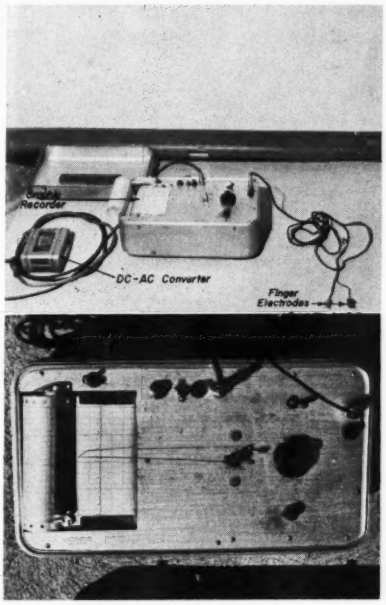



Figure 3

at least four years driving experience. None were familiar with the area or had prior knowledge of this study. The test area was approximately 150 miles from the College campus. Test drivers were driven to the test area in pairs and remained two nights while the study was being conducted in May and June 1960.

The commercially available GSR recording instrument belonging to the Bureau of Public Roads shown in Figure 3, was used to measure tension response. The GSR instrument consists of an alternating current wheatstone bridge, galvanometer, set of electrodes, associated amplifying circuitry and controls and a single channel graphic recorder providing a permanent record of the time fluctuation in skin resistance.

This recorder measures the GSR in units of the logarithm of conductance (the reciprocal of resistance). This unit of measurement is nearly linearly related to the magnitude of the inducing stimulus and is equivalent to measuring the percentage change in resistance[6]. The divisions on the ordinate of the graphic record represent equal increments of GSR. The absolute values of conductance depend upon the setting of the sensitivity scale and were not determined in this study.

At the beginning of a study the electrodes were connected to the first and third fingers of the test driver's left hand as shown in Figure 4. When the driver shown rests his left hand comfortably on his thigh or lap he is in operating position. This placement of electrodes is the same used by Dr. Michaels in his studies[10]. A sedan with an automatic transmission was used in the study, allowing the test drivers moderate freedom in operating the vehicle.

With the driver in the operating position for the start of an evening's study the normal level of skin resistance was determined. A startle stimulus (hand clap) was used to adjust the sensitivity of the GSR recorder. Full scale deflection with a startle stimulus provides adequate range for severse responses and detects more of the minor reactions than would some lesser sensitivity setting. This sensitivity setting was not changed for the rest of the evening. Drivers were studied for a period of time ranging from 1½ to 2 hours. All studies were conducted between 8 p.m. and 4 a.m. with most between 10 p.m. and 2 a.m., periods of very light traffic flow. Each driver repeated his study on the second night, generally at the same time of evening. During the studies drivers were observed for signs of fatigue and when necessary brief rest stops were made.

The study team consisted of four persons, the test driver, the GSR operator, and two assistants. The driver was alone on the front seat with the GSR operator and one assistant on the rear seat. The other assistant was concealed at the test intersection to control the intersection illumination. The driver was instructed to drive normally, not to speak, and when possible to try to avoid "floating" with other traffic moving in the same direction. He was assured that his driving ability was not being tested.

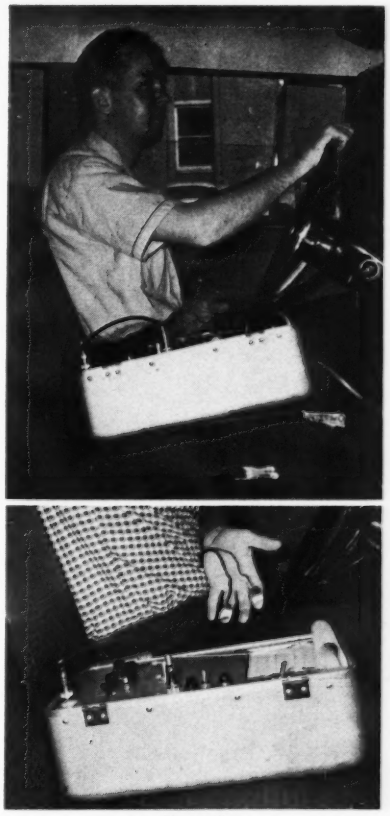


Figure 4

The graduate assistant field study leader operated the GSR recorder during the entire study. He observed the driver's reactions to the road and traffic environment and tended the machine. He recorded traffic or other unusual occurrences on the graphic record, marked the record at the beginning and ending of the test sections, and determined travel time over the test course with a stop watch. A sample GSR record is shown in Figure 5.

In the study area vicinity there are a number of similar appearing high-

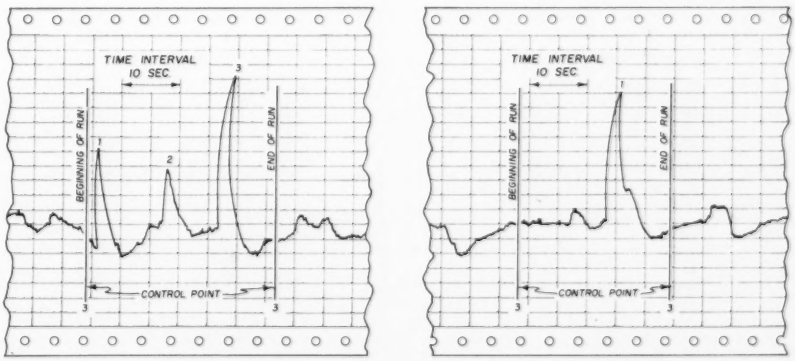



Figure 5
Sample GSR Records Showing GSR Magnitude and Responses with and without Illumination.

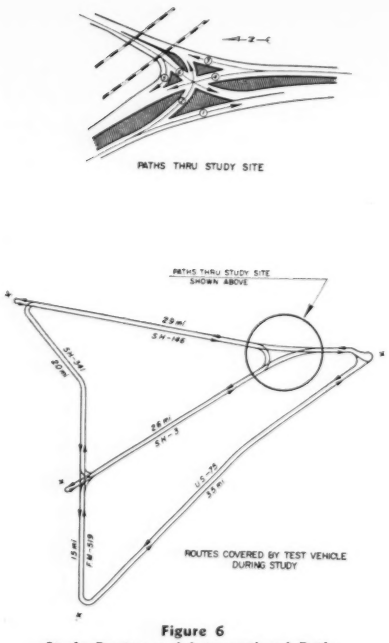



**Figure 6**
**Study Routes and Intersectional Paths**

ways and at least one other illuminated intersection similar in geometrics to the test intersection. The drivers were not informed of the intersection to be studied or other features of the study and after completion of the studies none indicated learning the purpose of the test. Apparently it was not noticed that the illumination conditions at the test intersection changed from passage to passage. The study route selected is shown in Figure 6.

A typical study run was conducted as follows. The run was started some distance from the test intersection on the test route. The driver was given instructions well in advance of each intersection as to his designated course. The GSR recorder was turned on approximately 1500 feet in advance of many intersections and turned off after reaching a point 1500 feet past these intersections. This kept the driver unaware of the study location since operation of the equipment made a little noise detectable by the driver. The actual study route was approximately 0.3 mile in length. Travel time through the study area averaged approximately 38 seconds and was usually less than 60 seconds. Once the driver had passed through the intersection he continued on and eventually returned to the intersection according to the experimental plan.

## Experimental Design

It was desired that the maximum amount of information be derivable from the study, considering the differences among drivers, between levels of illumination, among the six possible paths through this intersection, and the interactions between these factors. It was decided that each observation condition would be duplicated to detect any major field errors and to improve the sensitivity of the experiment. Realizing that a two-hour period represented a maximum practical continuous study period, each man could only conduct one complete study each evening. A complete factorial design suitable for a number of statistical analyses was used. On each evening each driver made twelve runs through the intersection, twice on each of the six paths, once with the illumination on and once with it off. The order of presentation of each condition was randomized within the evening. A total of 96 passes through the intersection was recorded by the four drivers.

## Data Reduction

The GSR operator and his assistant summarized the data from the chart as shown in Figure 5. The magnitude of each measurable response occurring in the study area was entered on the record. This information, along with the total travel time through the section, information on path, evening of study, driver, illumination condition, time of evening, and weather were transferred from field forms to McBee Keysort cards. The more routine analyses requiring use of the IBM 650 and IBM 704 digital computers at the A. and M. College Data Processing Center were conducted after preparing IBM cards from the McBee cards. A summary of the data for the four observers is shown in Table I.

**TABLE I**
**Summary of Data**

| Driver | | ILLUMINATION: ON, PATH 1 Rep 1 | ON, PATH 1 Rep 2 | ON, PATH 2 Rep 1 | ON, PATH 2 Rep 2 | ON, PATH 3 Rep 1 | ON, PATH 3 Rep 2 | ON, PATH 4 Rep 1 | ON, PATH 4 Rep 2 | ON, PATH 5 Rep 1 | ON, PATH 5 Rep 2 | ON, PATH 6 Rep 1 | ON, PATH 6 Rep 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Total response | 0 | 10 | 6 | 22 | 8 | 13 | 4 | 19 | 6.5 | 28 | 6 | 2 |
| | No. responses | 0 | 2 | 5 | 2 | 3 | 1 | 1 | 4 | 2 | 3 | 3 | 2 |
| | Travel time | 30 | 25 | 46 | 47 | 31 | 30 | 26 | 32 | 35 | 43 | 54 | 50 |
| 2 | Total response | 30 | 27 | 75 | 40 | 48 | 44 | 32 | 19 | 6 | 47 | 14 | 61 |
| | No. responses | 2 | 4 | 8 | 4 | 4 | 5 | 3 | 4 | 2 | 4 | 2 | 8 |
| | Travel time | 25 | 24 | 43 | 38 | 25 | 33 | 33 | 29 | 36 | 33 | 45 | 41 |
| 3 | Total response | 1 | 4 | 14 | 25 | 0 | 10 | 1 | 0 | 31 | 4 | 15 | 2 |
| | No. responses | 1 | 1 | 5 | 2 | 0 | 2 | 1 | 0 | 11 | 1 | 5 | 1 |
| | Travel time | 21 | 24 | 43 | 45 | 31 | 27 | 23 | 24 | 51 | 32 | 44 | 38 |
| 4 | Total response | 14 | 0 | 12 | 13 | 6 | 14 | 8 | 24 | 56 | 11 | 4 | 9.5 |
| | No. responses | 1 | 0 | 3 | 2 | 2 | 1 | 1 | 4 | 6 | 1 | 2 | 2 |
| | Travel time | 27 | 27 | 49 | 52 | 31 | 29 | 32 | 27 | 42 | 36 | 47 | 42 |

| Driver | | ILLUMINATION: OFF, PATH 1 Rep 1 | OFF, PATH 1 Rep 2 | OFF, PATH 2 Rep 1 | OFF, PATH 2 Rep 2 | OFF, PATH 3 Rep 1 | OFF, PATH 3 Rep 2 | OFF, PATH 4 Rep 1 | OFF, PATH 4 Rep 2 | OFF, PATH 5 Rep 1 | OFF, PATH 5 Rep 2 | OFF, PATH 6 Rep 1 | OFF, PATH 6 Rep 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Total response | 10 | 0 | 8 | 29 | 16.5 | 13 | 4 | 0 | 6.5 | 21 | 15 | 26 |
| | No. responses | 7 | 0 | 3 | 5 | 6 | 1 | 3 | 0 | 3 | 2 | 5 | 3 |
| | Travel time | 31 | 28 | 47 | 62 | 32 | 32 | 29 | 31 | 36 | 36 | 45 | 55 |
| 2 | Total response | 21 | 19 | 54 | 75 | 51 | 67 | 34 | 36 | 22 | 37 | 70 | 59 |
| | No. responses | 3 | 4 | 7 | 7 | 7 | 6 | 4 | 5 | 2 | 4 | 7 | 8 |
| | Travel time | 28 | 25 | 43 | 64 | 34 | 27 | 30 | 25 | 36 | 36 | 41 | 36 |
| 3 | Total response | 8 | 4 | 21 | 47 | 7 | 16 | 10 | 0 | 21 | 9 | 30 | 5 |
| | No. responses | 2 | 2 | 6 | 7 | 2 | 3 | 1 | 0 | 2 | 3 | 4 | 2 |
| | Travel time | 21 | 23 | 51 | 41 | 27 | 26 | 25 | 23 | 37 | 34 | 45 | 40 |
| 4 | Total response | 3 | 1 | 36 | 34 | 20 | 14 | 16.5 | 1 | 26 | 17.5 | 37 | 4 |
| | No. responses | 1 | 1 | 4 | 4 | 3 | 2 | 2 | 1 | 4 | 3 | 7 | 2 |
| | Travel time | 27 | 27 | 52 | 45 | 35 | 26 | 28 | 28 | 39 | 38 | 50 | 43 |

TABLE II
Significant Differences in Travel Time

| Factor | | Travel Time (Seconds) |
|---|---|---|
| Driver | 1 | 38.2 |
| | 2 | 34.6 |
| | 3 | 33.1 |
| | 4 | 36.6 |
| Path | 1 | 26.1 |
| | 2 | 48.0 |
| | 3 | 29.8 |
| | 4 | 27.8 |
| | 5 | 37.5 |
| | 6 | 44.8 |

## Analysis

*Travel Time*

Total travel time information for the four drivers was analyzed using a fixed effect model analysis of variance. The results of this analysis are shown in Table II. The differences between average travel time among the different drivers and among the different paths through the intersection were all significant. There was no significant difference between travel time under illumination as compared to travel time with the luminaires off. Average travel time through the intersection with illumination was 35.5 seconds and was 35.9 seconds without illumination.

TABLE III
Significant Differences in Total Number of GSR Responses

| Factor | | Average Total Number of Responses |
|---|---|---|
| Illumination | Off | 7.08 |
| | On | 5.55 |
| Driver | 1 | 5.50 |
| | 2 | 9.51 |
| | 3 | 5.34 |
| | 4 | 4.92 |
| Path | 1 | 3.88 |
| | 2 | 9.25 |
| | 3 | 6.00 |
| | 4 | 4.25 |
| | 5 | 6.62 |
| | 6 | 7.88 |
| Illumination × Path | On 1 | 2.75 |
| | 2 | 7.75 |
| | 3 | 4.50 |
| | 4 | 4.50 |
| | 5 | 7.50 |
| | 6 | 6.25 |
| | Off 1 | 5.00 |
| | 2 | 10.75 |
| | 3 | 7.50 |
| | 4 | 4.00 |
| | 5 | 5.75 |
| | 6 | 9.50 |

*Total Response*

Analyses of variance were made for four driver subjects using measures of the total number of responses and the total magnitude of these responses recorded on both nights. There was little difference between evenings. The results of these analyses are shown in Tables III and IV. For both measures there was a significant difference between illumination conditions among drivers and paths. The most significant result of this analysis is shown in Figure 7. Both the total number of tension responses and the total magnitude of tension responses was approximately 20% less with illumination than without illumination. There were 170 responses under nonilluminated conditions and 133 with the luminaires on. The total magnitude of 1082 reaction units was reduced to 846 tension reaction units by turning on the lights.

This result compares with Michaels' findings that one of the two urban streets studied produced an average of 40% fewer tension responses per minute than the other route[10]. It would be expected that the illumination of the "fixed object" hazard faced in this study would not reduce tension responses as much as Michaels found for the entire driving environment improvement.

*Rate Measures*

It was believed that analysis of the rate of occurrence of GSRs could equate all studies on a common time base. The results of analyses of variance conducted for four subjects are shown in Table V. Significant differences between average tension response rates were recorded between illumination conditions and among drivers. The results of this analysis with regard to illumination are shown in Figure 8. Each driver recorded reduced tension response when operating under illuminated conditions as compared to his performance without illumination.

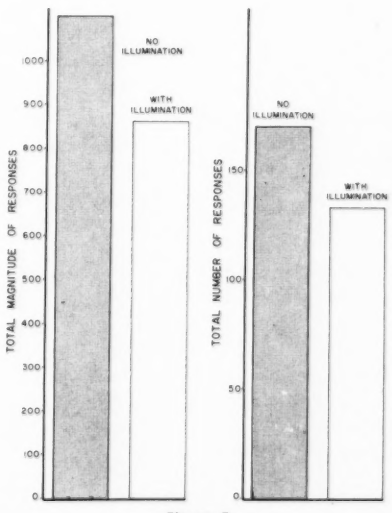



**Figure 7**
**Total Responses**

TABLE IV
Significant Differences in Total Magnitude of GSR Responses

| Factor | | Average Total Magnitude of Response |
|---|---|---|
| Illumination | Off | 45.1 |
| | On | 35.2 |
| Driver | 1 | 22.8 |
| | 2 | 82.2 |
| | 3 | 23.7 |
| | 4 | 31.8 |
| Path | 1 | 18.5 |
| | 2 | 62.9 |
| | 3 | 43.4 |
| | 4 | 26.1 |
| | 5 | 43.6 |
| | 6 | 45.0 |
| Illumination × Path | On 1 | 21.5 |
| | 2 | 51.8 |
| | 3 | 35.8 |
| | 4 | 26.8 |
| | 5 | 47.2 |
| | 6 | 28.4 |
| | Off 1 | 16.5 |
| | 2 | 76.0 |
| | 3 | 51.1 |
| | 4 | 25.4 |
| | 5 | 40.0 |
| | 6 | 61.5 |

TABLE V
Significant Differences In GSR Response Rate

| Factor | | Average Response Rate (Responses/Second) |
|---|---|---|
| Illumination | Off | .100 |
| | On | .077 |
| Driver | 1 | .072 |
| | 2 | .143 |
| | 3 | .072 |
| | 4 | .066 |

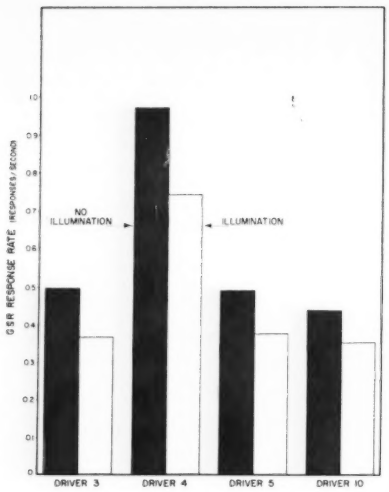
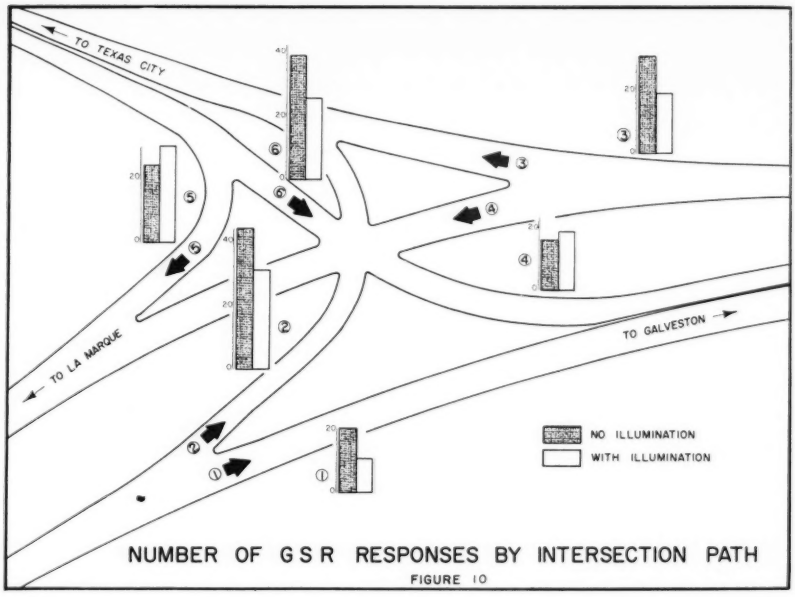



**Figure 8**
**GSR Response Rate and Illumination Condition**



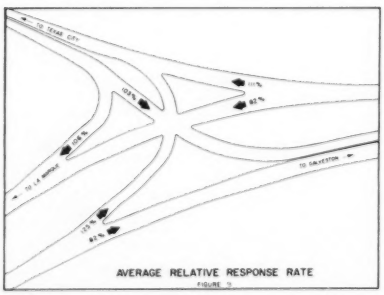

NUMBER OF G S R RESPONSES BY INTERSECTION PATH
FIGURE 10

*Path Through Intersection*

Figure 9 shows the average tension response rate for each of the paths through the intersection. The two free movements between LaMarque and Galveston generated substantially fewer tension responses per second than did the more complex movements. The ranking of the other paths by tension response seems to be closely related to degree of complexity of movement. The two main diverging movements had the greatest tension response rate; and the diverging movement that must stop and cross another major movement had the highest tension response of all paths.

Figure 10 presents the number of tension responses recorded on the various paths through the intersection under conditions of illumination and no illumination. The addition of illumination provided little tension response relief for movements 4 and 5. The location of the luminaires (see Figure 1) is such that movement 5 received little additional light and the high speed diverging movement, no. 4, is believed inadequately illuminated by a number of those who observed it in operation.

Substantial reductions in tension responses are noted on the other movements that are believed to be better helped by the minimum illumination provided.




*Discussion*

The implications of this study are that the GSR may offer a valuable contribution to the traffic engineering profession. Our use of it indicates that it has promise as a supplementary evaluator of geometric changes and control devices, such as signs, markings and signals. Our dynamic traffic environment studies so far underway indicate that with careful use it may be of value in high density traffic evaluations. The presence of other traffic has been shown to create a response and the extent of this response seems to be related to the degree of conflict with the other traffic.

## Acknowledgements

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# What's In A Traffic Signal?

By
Garland Fieser
Chief Design Engineer
Eagle Signal Traffic Control Division

To the average motorist a traffic signal is still just a box with lights. To the traffic signal manufacturer it's a product requiring top level engineering.

Among other loosely defined terms, commonly used in connection with many traffic signal specifications are:

1. Contrast; 2. Light Efficiency; 3. Hot Spot; 4. Sun Phantom.

To many of those who specify, these terms are no more than accepted words connected with the art. To the manufacturer, however, they represent hours of computation and study. Terms such as these, at best, mean different things to different people, making it difficult to specify, manufacture and test traffic signals on a common ground. Following are some definitions and basic computations as one manufacturer sees them. It is hoped that they will help establish numerical values for the defined quantities and a consequent better understanding of the subject.

*Contrast* is the ratio between the brightness at the center of the lens to the edge (periphery) of the lens. A high ratio indicates a *hot spot* in the center.

*Light Efficiency* is the ratio between the total lumens; striking the lens at right angles and total lumens emitted by the light source.

NOTE: In the following dissertation, the word "lens" is used loosely, as the traffic signal lens is not actually a lens. It has no focal length. It is a prism to (1) bend the rays down, (2) serve as a filter, giving the signal its color.

Computing for Contrast. (See Figure 1).

f = focal length of a parabolic reflector.

s = length (or depth) of the reflector.

a = distance from light source to lens.

d = diameter of reflector and lens.

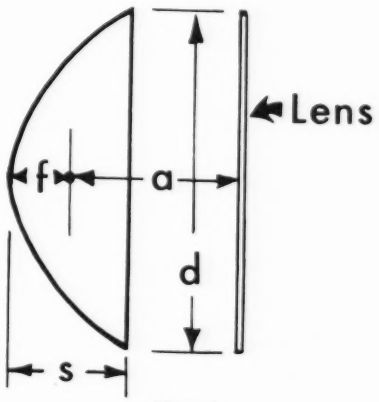


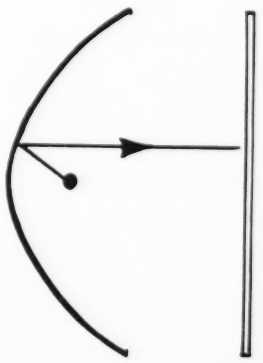

Figure 1

For a parabolic reflector:

$$d^2 = 16\ fs$$

To compute the *contrast*, it is necessary to compute four brightnesses:

a. At center of lens, due to light from the reflector.

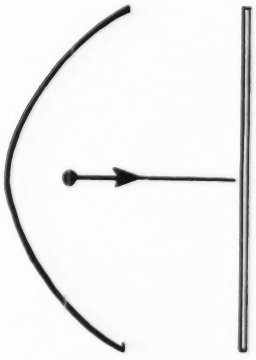


a) Light travels to the center of the reflector, a distance "f" (Figure 1). There it becomes parallel rays and does not lose its intensity in traveling to the center of the lens. Thus the brightness is proportional to:

$$\frac{1}{f^2}$$

Figure 2a

b. At center of lens, due to direct light from the source.

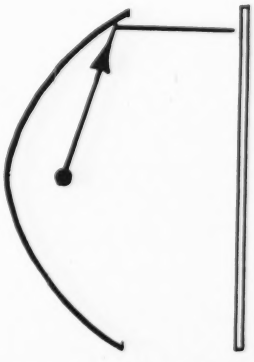


b) Light travels to the center of the lens, a distance "a", (Figure 1). Thus the brightness is proportional to:

$$\frac{1}{a^2}$$

Figure 2b

c. At edge of lens, due to light from the reflector.

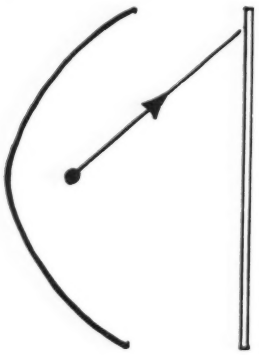


c) Light travels to the edge of the reflector, a distance s + f (Figure 1). There it becomes parallel rays and does not loose intensity in traveling to the edge of the lens. Thus the brightness is proportional to:

$$\frac{1}{(s+f)^2}$$

Figure 2c

d. At edge of lens due to direct light from the source.



d) Light travels to the edge of the lens, a distance

$$\frac{1}{a^2 + 4\ fs}$$

It does not strike the lens at right angles. The cosine of the angle of incidence is

$$\frac{a}{(a^2 + 4\ fs)^{1/2}}$$

Thus the brightness is proportional to:

$$\frac{a}{(a^2 + 4\ fs)^{3/2}}$$

Figure 2d

Thus, the *contrast* is:

$$\frac{\text{Brightness at ctr.}}{\text{Brightness at edge}} = \frac{\text{Reflector \& Source}}{\text{Reflector \& Source}}$$

or:

$$\textit{Contrast} = \frac{\dfrac{1}{f^2} + \dfrac{1}{a^2}}{\dfrac{1}{(f+s)^2} + \dfrac{a}{(a^2 + 4\ fs)^{3/2}}}$$

All the light striking the reflector is directed at the lens at right angles to the lens. The reflector reflects:

$\frac{s}{f + s}$ of the lumens emitted by the light source.

The light that strikes the lens at right angles, directly from the source is:

$$1/2 \left[ 1 - \frac{a\ (a^2 + 6\ fs)}{(a^2 + 4\ fs)^{3/2}} \right]$$

Thus the total efficiency is:

$$\frac{s}{f+s} + 1/2 \left[ 1 - \frac{a\ (a^2 + 6\ fs)}{(a^2 + 4\ fs)^{3/2}} \right]$$

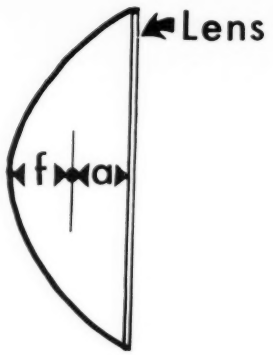



Figure 3
Class II Signals

A high *efficiency* may be obtained by making s = a + f. In other words, the lens would be directly against the reflector. There would be no light lost between the reflector and lens. *Efficiencies* would be theoretically above 90%. Minimum *contrast* occurs when a/f = 1.424. With these proportions, the *contrast* would be 12.36.

A *contrast* of 12.36 would be ideal . . . for use as a beacon at the end of an airport runway. Besides being extremely efficient, its brightness would be increased by the sun's rays during the day and by the plane's landing lights by night . . . *but, Class II signals make relatively poor traffic signals.* With the sun shining into them, they appear to be illuminated whether they are or not. They have built-in *sun phantom*, another term that of this writing, it is believed, has not been clearly defined.

*Sun Phantom.* External light striking the reflector, passing through the focal point and back to the reflector a second time to be directed out parallel to the incoming ray is called *sun phantom.* This is the path taken by the sun's rays that causes the traffic signal to appear illuminated when it is not.

A careful examination of Figure 4 shows that all objectionable rays strike the reflector twice and pass through the focal point between the two reflections. Further examination shows that, of the two reflections, one is always to the left of line AA, the other to the right. *Sun phantom* can, therefore, be virtually eliminated by removing that part of the reflector to the right of line AA. In other words, the reflector should be no longer than one focal length and in the interest of *efficiency*, it should not be materially shorter.

Figure 4

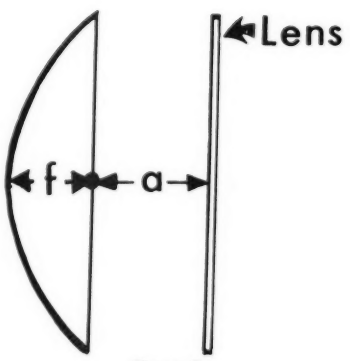



Figure 5
Class I Signals

Class I Signals are *anti-sun phantom* signals. They have a reflector with a focal length equal to (or greater) than 1/4 of the signals working diameter.

For this computation s = f. Minimum *contrast* occurs when a/f = 2.88. At this point, the contrast is only 3.54; *efficiency* is 52.2%. Higher *efficiency* may be obtained by making a/f less. When it is zero, 100% *efficiency* is theoretically possible. This, of course, would be impractical, since the lens would be required to pass through the light source.

Somewhere between a/f = 2.88 and a/f = 0 lies the compromise. In an effort to raise the *efficiency* and lower the *contrast* (the latter being infinite), striving for maximum edge brightness would be a good compromise, since edge brightness is highly desirable in the interest of signal visibility. This occurs when a/f = 1.414.

Since customer requirements are now commonly based on *cost* and

*lumen output efficiency*, manufacturers have found a/f = 1 to be the most effective compromise. The *efficiency* and the *contrast* are higher and the edge brightness is down, but the housing required for the design is smaller, and therefore less expensive and conducive to customer costs. Since *contrast* and edge brightness have been given little consideration to date, this design is currently acceptable.

Please note, in Table I, that currently typical Class I *anti-sun phantom* signal (a/f = 1) creates edge brightness of $5.43/d^2$ with a *contrast* ratio of 5.89. The "ideal" *anti-sun phantom* signal (a/f = 1.414) offers even more edge brightness with less *contrast*.

Compare Table I with Table II. You will note that the currently typical *sun phantom* signal (a/f = 1) creates high *efficiency* with correspondingly high *contrast (hot spot)*. It has reached its peak in edge brightness.

Table I
Class I Anti-Sun Phantom (f = s)

| a/f | Contrast Ratio | Efficiency | Edge Brightness | a + f | |
|---|---|---|---|---|---|
| ∞ | 4 | 50 % | $4/d^2$ | ∞ d | Reference only |
| 2.88 | 3.54 | 52.2% | $5.07/d^2$ | .970d | Minimum Contrast |
| 1.414 | 4.33 | 61.5% | $5.54/d^2$ | .604d | Maximum Edge Brightness |
| 1 | 5.89 | 68.7% | $5.43/d^2$ | .500d | Typical Signal |
| 0 | ∞ | 100 % | $4/d^2$ | .250d | Reference only |

Table II
Class II Sun Phantom Signal (a + f = s)

| a/f | Contrast Ratio | Efficiency | Edge Brightness | a + f | |
|---|---|---|---|---|---|
| ∞ | ∞ | 100.0% | $0/d^2$ | ∞ d | Reference only |
| 2.73 | 16.10 | 90.4% | $4.09/d^2$ | .483d | Minimum Efficiency |
| 1.424 | 12.36 | 91.4% | $4.68/d^2$ | .389d | Minimum Contrast |
| 1 | 13.50 | 92.6% | $4.74/d^2$ | .354d | Maximum Edge Brightness |
| 0 | ∞ | 100.0% | $4/d^2$ | .250d | Reference only |

NOTE: For rectangular signals, let d = length of working diagonal and all other values listed, except *efficiencies* are valid. *Efficiencies* will be somewhat lower than those listed.

### Summary

1. Cost and total lumen output *efficiency* are important . . . but should not be all important. Consideration should be given to *contrast* and edge brightness also.

2. A maximum value for *contrast* and a minimum value for edge brightness should be specified.

3. *Anti-sun phantom* should be specified (and verified). Definition should include parabolic reflector with focal length of at least 1/4 the working diameter.

4. High lumen output does not necessarily make a good traffic signal. *Hot spot* blending in the back ground creates high lumen output *(efficiency)* and is highly effective on a light meter, but is far from ideal as an indication to the motorist.

## MOTOR VEHICLE DEATHS AND CHANGES

| Months | DEATHS | | | | PERCENTAGE CHANGES | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Corresponding Months | | | 4 Months Moving Ave.* | |
| | 1956 | 1959 | 1960 | 1961 | 1956-1961 | 1959-1960 | 1960-1961 | 1959-1960 | 1960-1961 |
| January | 2,954 | 2,824 | 2,890 | 2,660 | —10% | | — 8% | | — 2% |
| February | 2,652 | 2,401 | 2,380 | 2,280 | —14% | | — 4% | | — 5% |
| March | 2,940 | 2,879 | 2,400 | 2,810 | — 4% | | +17% | | — 1% |
| April | 2,970 | 2,680 | 2,960 | 2,990 | + 1% | | + 1% | | + 1% |
| May | 3,094 | 3,199 | 3,330 | 3,130 | + 1% | | — 6% | | + 1% |
| June | 3,338 | 3,138 | 3,210 | 3,110 | — 7% | | — 3% | | + 1% |
| July | 3,555 | 3,286 | 3,450 | 3,310 | — 7% | | — 4% | | — 3% |
| 7 Months | 21,503 | 20,407 | 20,620 | 20,290 | — 2% | | — 2% | | |
| August | 3,535 | 3,502 | 3,470 | | | — 1% | | + 3% | |
| September | 3,653 | 3,381 | 3,490 | | | + 3% | | + 2% | |
| October | 3,476 | 3,386 | 3,690 | | | + 9% | | + 4% | |
| November | 3,603 | 3,527 | 3,430 | | | — 3% | | + 2% | |
| December | 3,858 | 3,707 | 3,500 | | | — 6% | | + 1% | |
| Total | 39,628 | 37,910 | 38,200 | | | | | | |

*Four Months Moving Average is based on changes between the totals for four months instead of one month. For example, the July figure shows the change between the totals for May-July 1960 and May-July 1960 and May-July 1961, etc. Adding several months together tends to smooth out single month changes which may be affected by differences in the number of weekends in a month from one year to the next, random variations, etc.

All 1956 and 1959 figures are from the National Office of Vital Statistics.
The 1960 and 1961 figures are National Safety Council estimates.

# Engineering A Realistic Counter-Attack On Old Man Winter

By Bellman D. Jones
Executive Secretary
Safe Winter Driving League

As March, 1961 roared out like a lion in some sections of the country and bleated lamb-like in others, traffic engineers and experts on the maintenance of winter streets and highways met for two days in a New York City hotel. It was the first Round-Table Conference on Urban Snow Removal and marked the first time that Old Man Winter has been recognized as a public enemy of sufficient importance to warrant a special gathering of snow-fighting specialists.

Participating were officials of leading Eastern cities—Boston, New York, Philadelphia, Buffalo, Pittsburgh, Washington and Baltimore. These and other cities in Eastern seaboard states were hard hit with repeated heavy snowfalls and prolonged traffic tie-ups during last winter. Participants included commissioners of public works, traffic, transit, sanitation, police and a variety of engineers concerned with snow removal and keeping traffic moving.

Acting as co-chairmen of the event were Brig. Gen. Frederick J. Clarke, Engineer-Commissioner for the District of Columbia, and Commissioner Frank J. Lucia of New York City's Department of Sanitation. These and other Eastern city authorities said snowplows and removal vehicles were often blocked or delayed by cars or trucks which became stalled and were abandoned by drivers who got stuck during early stages of snow storms due to inadequate traction.

## Chaotic Conditions Revealed

While major time at the conference was devoted to discussions and exchange of modern methods of winter maintenance to keep streets and highways open after snow storms, there was frank talk by delegates which revealed chaotic conditions during and following several of the blizzards last winter. Several commissioners and traffic engineers told how snow removal vehicles, and even fire-fighting equipment, were often unable to function during and after snow storms until hundreds of chainless vehicles, abandoned in the streets, were dug loose and towed away. There was general agreement that much public education is needed to secure more cooperation by the public, from the standpoint of avoiding unnecessary trips and the necessity of being equipped with adequate means for extra traction needed on snow or ice. This is vital to eliminate serious blockades and delays in future winters.

## Serious Fire Problems

That more tragic fires did not develop during these periods was purely coincidental. Boston had two fire deaths when normally controllable small fires got out of hand due to blockaded fire trucks, and it was only superhuman efforts combined with great luck all over the Middle Atlantic and Northeastern states that prevented astronomical fire losses.

There were other tremendous losses, however, caused by the traffic delays or complete blockades. Snow plowing costs were greatly increased, and losses from industries, offices and businesses being shut down for lack of workers and deliveries ran into multi-millions of dollars.

## Sound Planning

With these facts in mind, together with knowledge of traction tests by the National Safety Council, all authorities concerned are planning to prevent or minimize more serious trouble next winter. This includes Midwestern and Western snow-belt state officials. They had abnormally light snowfalls last winter, but more often than not they get it as bad or worse than the East did.

The engineers and commissioners of several cities urged that all drivers in snow-belt states face up to reality and be prepared by next fall by always carrying a set of reinforced tire chains in the trunk, ready for use when needed. Two of these cities, Washington, D. C., and Baltimore, Md., already have regulations which make it possible to declare "a state of traffic emergency" because deep snow, sleet or freezing rain is actually causing slippery or hazardous conditions which may lead to dangerous traffic congestion or blockades. This makes it possible to warn all drivers, before or during the onset of a severe snow or ice condition—that operators of all vehicles which are not equipped with effective tire chains or effective snow-tread tires are subject to arrest if their vehicles are stalled so as to obstruct traffic on any of the designated major arterial streets in the district. By newspapers, radio, television, the driving public is advised, both in advance and during a storm, to leave their cars at home or properly parked downtown if they do not have effective tire chains or effective snow-tread tires. The best way is to have both.

## Emergency Rules Help

While General Clarke of Washington, and Henry A. Barnes, Commissioner of Transit and Traffic in Baltimore, both declared these regulations were of considerable help, they said that snow tires were of relatively little value during severe conditions, or even during light snow or ice conditions wherever there were appreciable hills.

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The author is Chairman of the Sub-Committee on Public Information for the NSC's Committee on Winter Driving Hazards. He has participated in all of the tests since the Committee was created in 1938.

During and following several of the severe storms in the East last winter thousands of snow tire users, happy with their convenience during milder conditions of earlier winters, learned that they had to mount tire chains over their snow tires in order to negotiate deep snow or ice conditions.

While this was not news to traffic safety researchers who have studied winter driving problems, or to hundreds of thousands of drivers who learned it the hard way following development of severe conditions, many drivers in Eastern cities apparently learned it for the first time. Throughout snowbound Eastern seaboard states last winter many thousands of car and truck owners were equipped with tire chains and were able to get through early and serious stages of heavy snowfalls or glare ice. An equal or greater number of drivers, however, had procrastinated or not learned about the realities of winter preparedness. These drivers got stuck fairly early during snow storms. They often caused the tie-up of virtually all the traffic, including snowplows and the properly equipped vehicles, according to traffic engineers and snow removal officials.

### Realistic Plans

Following the conference in New York, Brig. Gen. Clarke talked with delegates to get their views on realistic plans for education of the public to prevent costly delays and chaotic conditions in future winters. The delegates were generally agreed that findings and recommendations of the Committee on Winter Driving Hazards should be heeded if the blocking of snow plows and fire trucks is to be prevented. This is also necessary to generally facilitate movement of all traffic during severe conditions. The driving public, they said, should be advised of such committee findings as the following:

1. "Tire chains are the most practical means of preventing prolonged delays and winter skid wrecks during severe weather and road conditions.

2. "Snow tires are also recommended as aids for average snowfalls in nonhilly areas, but do not replace occasional need for tire chains during deep snow conditions, or even on light snow or glare ice surfaces where there are hills."

### Dual Problem

The two co-chairmen of the conference, General Clarke and Commissioner Lucia, also issued the following statement:

"Preventing or minimizing traffic jams and accidents caused by snow or ice is a twofold problem," they said. "Realistic solutions to reduce delays and improve early snow clearing require two actions:

A. "Adequate budgets for modern snow-fighting equipment and manpower.

B. "Cooperation and preparedness with adequate and logical traction equipment by the driving public. This is vital when drivers choose, or find it necessary, to operate during snow or ice emergency conditions."

Without adequate budgets, without cooperation from the driving public, there may be a recurrence of the chaotic, costly and demoralizing delays such as occurred throughout the East last winter and which from time to time happen in other winter-affected states.

The conference delegates recommended nation-wide public education on findings of the National Safety Council's Committee on Winter Driving Hazards.

### HRB Paper

Some of these findings and recommendations were revealed at the 40th Anniversary Meeting of the Highway Research Board in Washington last January 12. This included the low-down on the stop-and-go traction performance of various types of tires and tire chains on snow and ice-covered roads.

Professor A. H. Easton, Director of the Motor Vehicle Research Laboratory of the University of Wisconsin and Chairman of the Council's Winter Committee, told highway and traffic engineers that special winter tires are of definite aid for mild to medium conditions. He advised, however, that reinforced tire chains are by far the most reliable means to help the driving public avoid prolonged traffic delays and skid-wrecks during severe conditions. He referred to the snow or ice conditions such as had stalled unequipped vehicles and blocked all traffic, including snowplows and fire departments, in most Eastern seaboard states last December 11-15.

Similar conditions cause identical delays in many other states every winter, according to traffic engineers at the HRB meeting. Several told of plans to initiate municipal regulations requiring adequate traction during emergency conditions. Others spoke of good results by public education about the realities of winter traction problems.

### Test Facts

Professor Easton, who has repeatedly risked his limbs and life in winter test driving, described for the engineers the exhaustive test programs at Clintonville, Wisconsin. He illustrated by motion pictures and charts the following basic findings and recommendations for safer winter driving. He recommended that all snow-belt drivers be made aware of the following test facts:

*Winter Starting*—When it comes to starting and pulling ability on glare ice, snow tires are 28 per cent better than regular tires; regular tire chains 231 per cent better, while reinforced tire chains are 409 per cent better. On loosely packed snow, the snow tires are 51 per cent better than regular tires, whereas reinforced tire chains provide 313 per cent better traction.

*Stopping Ability*—On glare ice, at only 20 mph, braking distances for regular tires average 195 feet. Snow tires take 174 feet, regular tire chains 99 feet, and reinforced tire chains 77 feet. At 20 mph on loosely packed snow, regular tires stopped in 60 feet, snow tires 52 feet, regular tire chains 46 feet, and reinforced tire chains 38 feet.

*Basic Conclusions*—Professor Easton summarizes other basic conclusions from his winter driving tests, to aid drivers in 43 snow-belt states just before severe weather and road conditions set in, as follows:

### Basic Findings

1. The most hazardous winter surface condition is ice near or at the freezing temperature.

2. Braking distances on winter surfaces are in the order of 3 to 12 times as great as those on bare pavement.

3. Tires and traction devices listed in the approximate order of increasing effectiveness on winter surfaces are given below.

a. Smooth tires—Very poor in cornering. Should not be used.

b. Regular tires—Inadequate under many winter conditions.

c. Winterized tires (tread treatment and additives)—Provide better traction on ice; not much improvement in snow over regular tires.

d. Mud-snow, modern design—Provide better snow and ice traction than regular tires.

e. Embedded metal coils, serpentine ribs—Provide better snow and ice traction than regular tires. Effective on wet ice.

f. Sanders — Performance outstanding in traction on ice only.

g. Round wire tire chains—Good stop-and-go performance on ice and snow. Side-skid resistance low compared to reinforced tire chains.

h. Reinforced tire chains—Best overall performance on ice and snow.

4. A driver should select the tire that best suits his situation, and supplement it with reinforced tire chains when needed for severe conditions. A set of chains should always be carried in the trunk.

5. Pump brakes to reduce skidding, maintain steering control and shorten stopping distance. Use brakes judiciously to evaluate road surface if questionable.

6. If a vehicle begins to skid, the driver should reduce the power and turn the steering wheel in the direction of the skid until recovery begins.

7. The application of power and steering forces should be gradual and smooth on winter surfaces.

8. Use recommended tire pressures for best tire performance on ice.

9. The ideal brake for ice would be one which would produce maximum deceleration without wheel skid.

10. Inertia anti-skid devices show no beneficial effects.

11. To maintain the best possible visibility, windshield wiper arms should exert a load on the blade, such that the pressure will be one ounce per inch of blade length.

12. The light and compact vehicles outperform the heavier vehicles on ice in the passing maneuver test where a shorter wheelbase is a distinct advantage. However, on constant radius curve, the heavier vehicle will outperform the lighter vehicle. In braking, the lighter vehicle will outperform the heavier vehicle. A summary for 1500-3000, and 4500 lb. passenger cars is shown in Table I.

### Misleading Ads

In discussing the winter problem, Professor Easton said the Committee must occasionally take a stand against items whose performance is not in accord with advertising claims. He said the Committee had passed the following resolution: "Misleading advertising concerning non-skid properties of tires can become an indirect cause of costly traffic tie-ups and painful accidents by leading motorists into taking risks of which they are not fully aware."

He concluded by saying, "It is unfortunate that some winter tire advertisers get carried away and present misleading information which is unfair to the majority of companies which stick to the factual information by stating the genuine progress they have made in the improvement of winter tires."

TABLE 1
COMPARATIVE RATING

| | 1500 | 3000 | 4500 |
|---|---|---|---|
| Braking | 158 | 107 | 99 |
| Passing Maneuver | 116 | 106 | 98 |
| Cornering | 91 | 96 | 102 |


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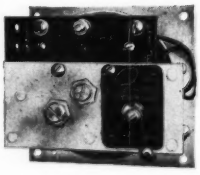

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Requirements: Age 21 to 64, with education equivalent to graduation from accredited four-year engineering school. Experience may be substituted, year for year. At least three years of professional traffic engineering experience. One year of graduate study may be substituted for one year of experience.

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### MADISON, WISCONSIN

Position: Civil Engineer II.

Qualifications: Possession of a valid certificate of Engineer-in-Training. Civil Engineer graduate from accredited college or university. Traffic experience desirable.

Salary: $6,252 to $7,824.

Apply: Personnel Department, City-County Building, Room 404, Madison 9, Wisconsin.

# Traffic News

## World Traffic Engineering Conference Held in Washington; 1200 Attend

The World Traffic Engineering Conference was held in Washington, D. C., from August 21 through 26. This conference combined the 31st Annual Meeting of the Institute of Traffic Engineers and three days of International Sessions in traffic engineering. The week was followed by a study tour by bus which left Washington on Monday, August 28 and returned to Washington on Saturday, September 2.

Total attendance at the Washington meeting was over 1200. There were 805 total registrations, with 244 women and more than 150 children. Of the 805 registrations, 400 attended the International Sessions from August 24 to 26. The study tour by bus attracted 105 persons, about 90% of whom were visitors from other countries.

The international complexion of the meeting was clearly indicated by the presence of delegates from 34 countries, including large delegations from Great Britain, France, West Germany, Switzerland, Sweden, Italy and Spain. Latin America was represented by 16 people. Australia, the Netherlands, Denmark and Yugoslavia each had four representatives, and Japan had five. Single delegates were present from Austria, Finland, Greece, Israel, Jordan, Lebanon, Nigeria, the Philippines, and Saudi Arabia. Canada and the U. S., of course, had the largest groups.

The Annual Meeting of the Institute, which was held from August 21 to 23, opened with the presentation of two awards, the Past Presidents' Award of the Institute and the Matson Memorial Award. The Institute award went to Donald E. Cleveland of Texas A & M and the Matson Memorial Award was presented to John E. Barker of the Automatic Signal Division of Eastern Industries. Each of the award winners presented a paper.

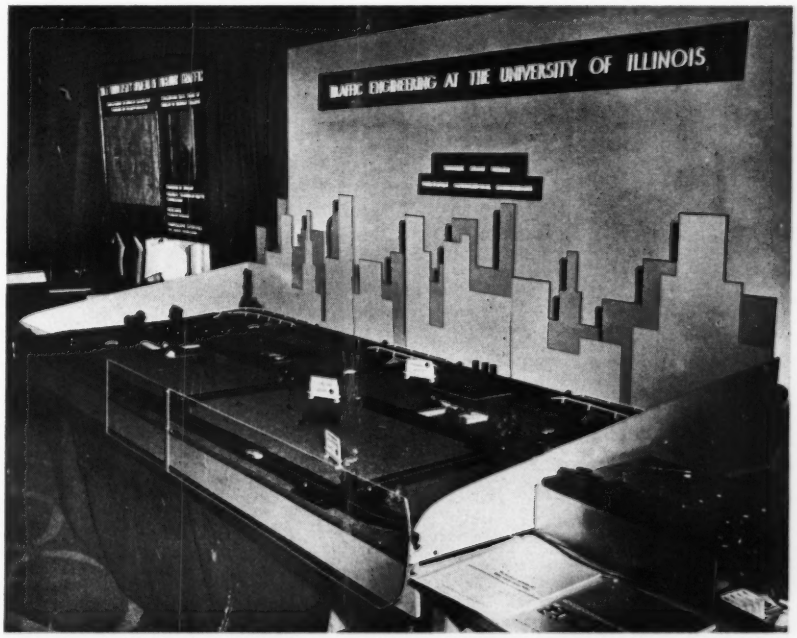
The opening luncheon on Monday noon was featured by an inspiring address by Paul Ylvisaker of the Ford Foundation, who spoke on "The Urban Problem—Now and Future." His address set the stage for the afternoon session when four representatives of housing authorities, industry and planning discussed objectives in metropolitan area development. The underlying theme of the need for transportation and the relationship between transportation and urban land development and redevelopment was most apparent throughout this session.

The following two days of the Institute meeting were devoted largely to programs developed by the technical committees of the Institute. Good attendance was reported at meetings of committees and technical departments.

The annual business meeting was held on Tuesday afternoon with what was perhaps the largest attendance in Institute history. The meeting was climaxed by the annual banquet, attended by 600 persons, served buffet style in the large banquet hall of the Sheraton Park Hotel in Washington. An entertainment program designed to show our visitors something of a cross-section of American entertainment featured a colorful group of square dancers, a professional harmonica virtuoso and the U. S. Army Chorus.

The International Sessions, which

**Pictured at the Annual Meeting, l. to r., are President Malo; Brig. Gen. Frederick Clarke, D. C. Engineer-Commissioner; E. H. Holmes, Asst. Commissioner for Research, Bureau of Public Roads; and Burton W. Marsh, AAA Director of Traffic Engineering and Safety, and Chairman of the local arrangements committee.**




**A feature of the 31st Annual Meeting was a "technical information center" with a number of interesting and colorful exhibits. Pictured is the University of Illinois exhibit, with moving cars controlled by miniature traffic signals.**

opened the next morning in the new State Department Building, were a new experience for many of those in the audience. Simultaneous interpretation was provided so that all speeches and remarks were available to those in the audience in English, French, German, Spanish or the Yugoslavian language. The opening session was held in the same auditorium in which the President conducts his news conferences, with all following meetings held in the main conference suite of the State Department Building.

The technical program featured six basic themes, as follows: Scientific Research and International Cooperation in Research; Urban Transportation; Design of Rural Interchanges; Highway Traffic Accident Research; Electronics in Traffic Control; and Freeway Operation. In each case, papers were prepared in advance and distributed to registrants. These papers were not read in the sessions, but were summarized by a general reporter. During the discussion which followed each presentation by a general reporter, authors of the papers and members of the audience participated freely.

The advance papers are available in published form from Institute headquarters at $7.50 a copy, in English or in Spanish. A French edition is available from the office of the World Touring and Automobile Organisation in London. Copies of the general reporters' papers will be included as long as the supply lasts.

Papers presented at the 31st Annual Meeting of the Institute will appear in the Annual Proceedings, to be published by the Institute shortly after the first of the year.

## Barker Named Matson Award Winner

John L. Barker (Mem., ITE) was named 1961 winner of the Theodore M. Matson Memorial Award at the annual meeting of the Institute of Traffic Engineers held in Washington in August.

John L. Barker (on right) receiving congratulations from Paul L. Green after the introduction of the Matson Award winner.

Barker, who is director of research for Automatic Signal Division of Eastern Industries of Norwalk, Connecticut, was honored for his pioneering work in the development of instruments and apparatus used in the control and study of traffic movement. Following the presentation of a citation and a plaque to Mr. Barker by Paul Green, also a member of the Institute, the honoree presented a paper before the opening session of the Institute's 31st annual meeting.

The Award is presented annually in memory of Theodore M. Matson by a group of friends and former associates, recognizing each year some individual who has made outstanding contributions to traffic engineering. Former recipients include: O. K. Normann; D. Grant Mickle, Charles W. Prisk and Burton W. Marsh.

## TD&R Funds Allotted

Based on the recommendations of the ITE Technical Council, the Board of Direction has agreed to support two research projects with money from the Technical Development and Research Fund. This is the first allotment to be made from the Fund which was approved by the membership last October.

A total of $6050 has been alloted for the two projects. Of this amount, $3250 is being granted to the Institute of Transportation and Traffic Engineering where Mr. James H. Kell will undertake a project titled "Effect of Installing Traffic Signals at Intersections of Vehicular Delay." Mr. Kell intends to develop a model to simulate vehicular traffic at intersections on high speed computers. Once such a program is prepared, it will be used to determine the delays experienced by vehicles, develop criteria for signal timing and provide a basis for refining existing traffic signal warrants. The ITE grant, representing about 20% of the total project cost, will be used to carry out the simulation.

The second project, titled "Factual Warrants for Left-Turn Channelization", is to be undertaken by Mr. Olin K. Dart at the Texas Transportation Institute. Mr. Dart's project is designed to provide the traffic engineer with warrants for the introduction of a separate left turning lane on the approach to an intersection and with data for determining the length of such a lane. Supplemental information which will be obtained as part of the study will include data on the characteristics of left-turning drivers and the practicality of applying digital computer simulation techniques to a traffic engineering problem. The ITE grant will be used to support the study by Mr. Dart for a period of one year.

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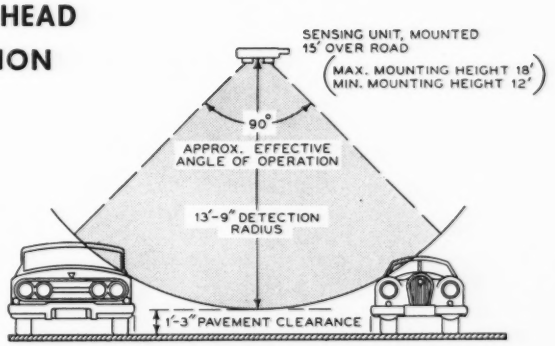
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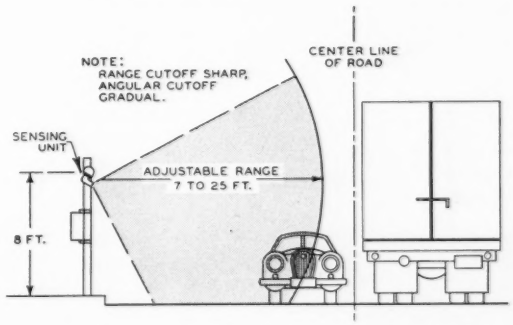


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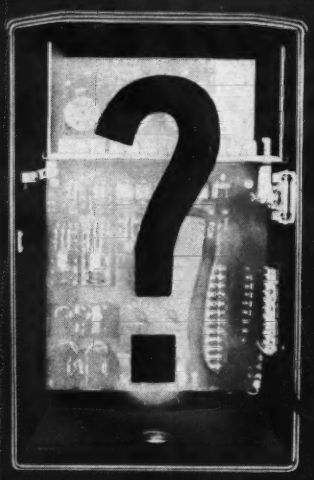

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## Advanced TE Workshop Scheduled

The second annual Advanced Traffic Engineering Workshop will be conducted November 13-17, 1961, at the Traffic Institute, Northwestern University, Evanston, Illinois.

Only graduates of Traffic Engineering Seminars at the Traffic Institute are eligible to attend the workshop.

Seminar graduates have been surveyed and asked to select study areas that will meet their professional needs. Directors of urban and state highway engineering departments have been asked in what areas their engineers need training.

Workshop projects will be selected from such areas as Design and Operation of Traffic Signal Systems; Geometric Design of Primary Urban Streets; Geometric Design of High-Speed Facilities; Freeway Operations; Traffic Planning for Central Business Districts; Urban Transportation Planning; and Parking: Study Techniques and Plan Development.

The Advanced Traffic Engineering Workshop was held last fall for the first time, in response to many requests for advanced study in traffic engineering. Many seminar graduates indicated that after two or three years in the field they wanted to broaden their experience with additional training.

The workshop is directed by George W. Barton, director of Traffic Engineering, the Traffic Institute. Barton also is a member of the faculty of the Technological Institute of Northwestern University and engineering director of Barton-Aschman Associates.

Tuition for the workshop is $85, including course materials. For more information write George W. Barton, director, traffic engineering, the Traffic Institute, 405 Church Street, Evanston, Illinois.

## President's Committee For Traffic Safety Appointed

President John F. Kennedy has appointed a chairman and eight members to the President's Committee for Traffic Safety. William R. Hearst, Jr., is to continue as chairman of the Committee and one former member, Charles F. McCahill, Ohio publishing company executive, also has been reappointed.

The new members are: Benjamin H. Swig, San Francisco real estate man; C. J. Haggerty, Washington labor leader; Ralph Bradley, Illinois government official; Katharine E. White, New Jersey Highway Authority chairman; Mrs. H. H. Kodani, California civic leader; Benjamin L. Arnold, Sr., Arizona State Senator; and Wesley Powell, governor of New Hampshire, who will be the representative of the National Governor's Conference.

All the new members are Democrats except for Governor Powell and Mrs. Kodani, who are Republicans. Hearst and McCahill are Republicans. Governor Powell replaces J. Caleb Boggs. The other six members replace Mrs. Raymond Sayre, Charles B. Shuman, Robert Snodgrass, T. S. Petersen, P. L. Siemiller, and Howard J. Pyle. All the members serve without pay.

## C. C. Wiley Traveling Award in Highway Engineering

Ward R. Malisch, University of Illinois student, received the C. C. Wiley Traveling Award in Highway Engineering for 1961. The award of $1,200 is made to a senior student in highway engineering for travel by car in the United States (and Canada) during the summer following graduation to study and report on highway transportation problems.

Malisch, valedictorian of the 1957 class of the Henry-Senachwine Consolidated High School, had an itinerary which took him from his home to Texas, with stops in Illinois, Missouri, and Arkansas; then up the Atlantic Coast to Washington and New York City, with stops in Louisiana, Alabama, Georgia, North Carolina and Virginia; and finally home through Buffalo and Detroit. Trip dates were from June 18 to September 1. In the fall he returned to the campus for work on his master's degree and as a part-time research assistant on a highway engineering research project.

The award is based principally upon the excellence of a design project carried out by students in the senior highway design course, with consideration given also to scholastic standing, personal characteristics, and demonstrated interest and ability to profit from travel. Funds are provided by an Illinois highway contractor who is an Illinois civil engineering graduate. This is the seventh presentation of the award.

## Moore to Head HRB Committee on Information

John E. Moore, manager of the Public Information Department of the National Highway Users Conference, has been appointed chairman of the Special Committee on Public Dissemination of Research Findings of the Highway Research Board, National Academy of Sciences—National Research Council.

William A. Bugge, chairman of the Board and director of highways, Washington State Highway Commission, made the appointment.

Mr. Moore, who has been a member of the public information committee since its organization, has been active in highway transportation public relations for many years. Formerly associated with a Washington public relations firm, he has managed NHUC public information activities since 1951.

The HRB information committee is made up of experienced public information specialists who volunteer their services and advice in publicizing results of the continuing research being done in highway administration, engineering, construction and allied fields.

## Thomas E. Walbert

Thomas E. Walbert (Mem., ITE) died suddenly on September 3, in New Haven, Connecticut. He was 49 years old.

Mr. Walbert was doing consulting work at the time of death. He entered private practice in 1958, after several years with Wilbur Smith and Associates. Earlier he had been in charge of traffic engineering work at the Savannah River Plant which was built by DuPont for the government.

Prior engineering engagements included work with the Michigan State Highway Department and the Arkansas State Highway Department. During World War II he saw service as a traffic engineer in the European Theater, serving in the Transportation Corps.

Mr. Walbert was born in Arkansas and attended Wayne University and the University of Michigan, where he received his B.S. degree. In 1940-41 he attended the Yale Bureau of Highway Traffic.

In front, reading from left to right, Professors Oka, Jakovljevich, Claffey (Coordinator), Jovich (Dean of School of Transportation, University of Belgrade), and Biberstein (Head of Department of Civil Engineering, Catholic University). On the steps, Professors Kreculj, Djokic, Sauic, and Stojanovic and Mr. Petrovich (interpreter).

## Yugoslav Engineers At Catholic University; Attend World TE Confab

Senior Yugoslav professors from the School of Transportation, University of Belgrade, were in Washington under the auspices of ICA to attend a Special Transportation Engineering Seminar at Catholic University, August 17 to September 22. During this period and as part of their studies four attended ITE Sessions, August 21-23, the World Traffic Engineering Conference, and the traffic engineering tour to New Haven.

The group will tour major centers of transportation study in the United States (northwestern, Michigan State, I.T.T.E. etc.) between September 23, and October 30 when they will return to Catholic University for a final week of study.

---

Wife: "Suppose we wives went out on strike?"

Hubby: "Go ahead; I've got a peach of a strikebreaker in mind."


**FOR ACCURATE MEASURING**

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**For TRAFFIC ENGINEERS**

- Non Rusting
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SEND FOR LITERATURE

Outlined with "Codit" Reflective Liquid...

# GEORGIA'S NARROW BRIDGES NOW LIGHT UP AT NIGHT

**Reflectorized bridge is seen at half a mile...**

**and takes shape...**

**...as the driver comes closer**

To help drivers safely cross narrow bridges in the dark, the Georgia State Highway Department is using a unique form of "lighting." Over 800 sub-standard bridges (less than 24 feet wide) are being *outlined* with "Codit" Reflective Liquid. As a result they light up brilliantly at night when touched by headlight beams.

Tests show that a bridge reflectorized with "Codit" Reflective Liquid is first noticeable to a driver at about half a mile. He is immediately alerted, and as he comes closer the bridge begins to take shape. Its width and length are brightly outlined—a welcome guide to a safe crossing.

Georgia highway officials believe that this reflective material will definitely help reduce accidents and fatalities on narrow bridges. "Codit" Reflective Liquid is easy to apply to either smooth or porous surfaces. One step. One coat. It reflects 50-100 times brighter at night than white paint—and stays on the job for years.

**BEFORE BEING PAINTED** with "Codit" Reflective Liquid, this bridge was a nighttime hazard. It took sharp eyes to spot it, even up close. The ultimate remedy for any narrow bridge is to make it wide enough to handle today's cars and trucks. The next best solution—but an *immediate* one—is reflectorization with "Codit" Reflective Liquid.

**APPLICATION IS EASY.** "Codit" Reflective Liquid goes on like regular paint, with either brush or spray gun. Only one coat is needed. It's white by day, then amazingly bright by night because it contains millions of tiny reflective elements. And its long life provides protection for years.

***HOW MANY narrow bridges need to be made safer in your county or state? Ask your 3M Representative for complete information on the ready answer: "Codit" Reflective Liquid. Or write Dept. RCS-101, The 3M Company, St. Paul 6, Minnesota.***

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BRAND
**REFLECTIVE LIQUID**

MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW

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# New Appointments

## Kansman Named TE of Dade County, Florida

Sven Kansman, (Mem., ITE) has been named traffic engineer of Metropolitan Dade County, Florida. In this new position, Kansman will be a division head in the county's Department of Public Works.

*Sven Kansman*

Kansman, for the past year and a half a planning engineer with Food Fair Stores in Miami, worked for a consulting firm in Miami from 1957 to 1960. Earlier he worked for the Detroit Department of Streets and Traffic and for the Wayne County Road Commission.

A civil engineering graduate of Wayne University, Kansman attended the Yale Bureau of Highway Traffic in 1948-49. He is a registered professional engineer in Michigan.

## Barr Leaves Dade County for Consulting Field

John W. Barr (Assoc. Mem., ITE) has joined the staff of Roy Jorgensen and Associates of Washington, D. C., operating in the field of highway management consulting. Initially, Barr will be working in Frankfort with the Kentucky Highway Department, advising them in the establishment of their highway planning program and its organization.

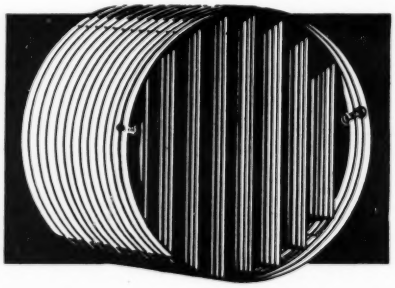
Barr had until the end of August been with Metropolitan Dade County, Florida, for three years as traffic planning engineer for the Department of Traffic and Transportation. When he left the county, he was Director of Traffic Engineering.

Earlier, Barr had worked for the Florida State Road Department for three years doing traffic, planning and design engineering work. Before going to Florida, he was a research assistant at Purdue University, where he obtained his B.S. and M.S. degrees in civil engineering.

*John W. Barr*


**STRAITRAY**

**Scientifically Controls Traffic Signal Visibility**



**Do a better, more efficient job on your Signal System at small additional cost.**

With STRAITRAY Ray Director the Signal Light is seen only by the motorist or pedestrian required to obey that signal. Eliminates the practice of "jumping the light" as there is no "tip off" as to when light is about to change.

*Write for FREE technical brochure and price schedule:*

PAM COMPANY
1951-B N.W. Wilson Street
Portland 9, Oregon


## Chronister to Nashville; Evans to Baton Rouge

Joseph S. Chronister (Assoc. Mem., ITE) has been named city traffic engineer in Nashville, Tennessee, leaving Baton Rouge to take this new post.

Duaine T. Evans (Assoc. Mem., ITE) has moved from the Louisiana Department of Highways into the spot vacated by Chronister, becoming city traffic engineer of Baton Rouge.

Chronister had been in Baton Rouge since 1956, following his completion of the Yale Bureau course. Earlier he had worked for the Kansas State Highway Department and the city of Kansas City, Kansas.

Evans, an engineering graduate of Louisiana State University and a Yale Bureau graduate in 1954, has been with the Louisiana Highway Department since 1950. He is a registered professional engineer in Louisiana.

## Musick to Winkomatic

James V. Musick (Mem., ITE) has been appointed chief applications engineer with Winko-Matic Signal Company in Lorain, Ohio.

*James V. Musick*

Musick had been state traffic engineer in Ohio since 1959. Earlier he spent five years with the City of Columbus, as chief traffic engineer. He began his traffic career in Cincinnati, and spent two years in traffic with the U. S. Air Force Materiel Command.

A civil engineering graduate of the University of Illinois, he completed the Yale Bureau of Highway Traffic course in June, 1951. He is a registered professional engineer in Ohio.

Musick has been active in Ohio Section activities of the Institute, serving as an officer for the past two years. He is also currently the chairman of an Institute technical committee studying pavement edge lines.

## Eugene Ireland Joins Motorola Staff

Eugene F. Ireland (Assoc. Mem., ITE) has resigned from the Washington State Highway Department to become the West Coast representative of Motorola, with the title of radio traffic control representative.

*Eugene F. Ireland*

Ireland has been in the traffic signal field since 1950. For five years he worked for the California Division of Highways, and more recently spent six years with the Washington State department. He is an engineering graduate of California State Polytechnic College in San Luis Obispo.

## Baerwald Named Director

Dr. John E. Baerwald, (Mem., ITE), University of Illinois, Professor of Traffic Engineering, will devote one-half time during the year 1961-62 as Director of the Highway Traffic Safety Center, which was established by the University Board of Trustees this month, to coordinate on a university-wide basis present and future programs in this field and work with outside agencies. The new university unit is established in the College of Engineering under the direction of the Dean of the College. It will coordinate the university's activities in safety teaching and research, provide a channel through which financial support—including that from agencies outside the university—can be made available for such efforts, and facilitate use of resulting traffic safety information. Twenty university departments were reported as working in or interested in highway safety activities. The Center is being started on a very limited basis since sufficient funds are not available for full operation.

## Job Changes

Robert M. Chryst—formerly City Traffic Engineer with the City of Lancaster, Pennsylvania; is now Assistant District No. 8 Traffic Engineer with the Pennsylvania Department of Highways in Harrisburg, Pennsylvania.

George H. Kunde—formerly Director of Metropolitan Department of Traffic & Transportation in Miami, Florida; is now a consulting engineer with the firm of Kunde, McGlinchy & Pundt in Miami, Florida.

Sheldon Rice—formerly Traffic Engineer with Wilbur Smith & Associates in San Francisco, California; is now Assistant Traffic Engineer for the City of Sacramento, California.

Morris Rotman—formerly Traffic Analysis Engineer with the Department of Public Works of the City of Toronto, Ontario; is now Traffic Planning Engineer with the firm of Lazarides, Damas & Smith in Toronto, Ontario.

William Schempers, Jr. — formerly Traffic Engineer with the Engineering Department of the Automobile Club of Southern California in Los Angeles, is now Associate Traffic Engineer with the City of San Diego, California.

## Title Changes

Vincent Ciletti—is now Division Programing & Planning Engineer with the Ohio Division of the Bureau of Public Roads in Columbus, Ohio; was Assistant Programing & Planning Engineer.

Jack A. Daniels—is now Traffic Engineer II with the City Traffic Engineering Department in Fort Worth, Texas; was Engineer I.

Theodore Dec—is now District Engineer, Oregon Division of the Bureau of Public Roads in Salem, Oregon; was Programing & Planning Engineer.

Vincent E. Grimm, Jr.—is now Engineer of Design with the City of Miami, Florida; was Traffic Engineer.

James R. Guthrie—is now Intelligence Research Specialist with the U. S. Army Transportation Intelligence Agency in Arlington, Virginia, was Chief, Technical Intelligence Branch of the Plans & Training Division of the U. S. Army Transportation Terminal Command, Pacific, in San Francisco.

Joseph W. Guyton—is now Transportation Planning Engineer with Harland Bartholomew & Associates in Memphis, Tennessee; was Traffic Engineer for the same organization in St. Louis, Missouri.

Alexander Harvey—is now Vice President of De Leuw, Cather & Co. of Canada, Ltd. in Toronto, Ontario; was Project Manager.

John C. Myatt—is now Chief Engineer, Highways Division, Department of Transportation in Honolulu, Hawaii; was Deputy State Highway Engineer.

THE NEW TELESCOPING
WARNING-SCOPE
by
Hawkins
THE NAME IN HIGHWAY SAFETY

Illustration height 11 feet. Leg spread diameter 61 inches. Basic assembly only weighs 15 pounds. Knurled locking nuts adjust height as desired. Nylon Vinyl Fluorescent Flags. Nylon Vinyl Roll-up sign or clamps to hold metal signs.

High tensile aluminum staffs and sturdy steel tripod base compactly folds to 6 by 43 inches.

Write for Pamphlet and Prices.
Distributors Invited.

Mfgrs:
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1255 Eastshore Highway
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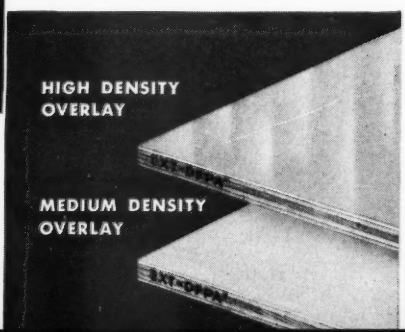
# Idaho cuts maintenance a
# with quality signs

On standard black-background informational signs, reflective letters are applied directly to black High Density overlaid plywood, eliminating painting.

High Density overlaid plywood needs no protective painting; color (black, brown or amber) is in the overlay. Medium Density is for plain painted signs. Base panel is waterproof Exterior plywood.



# e and replacement costs
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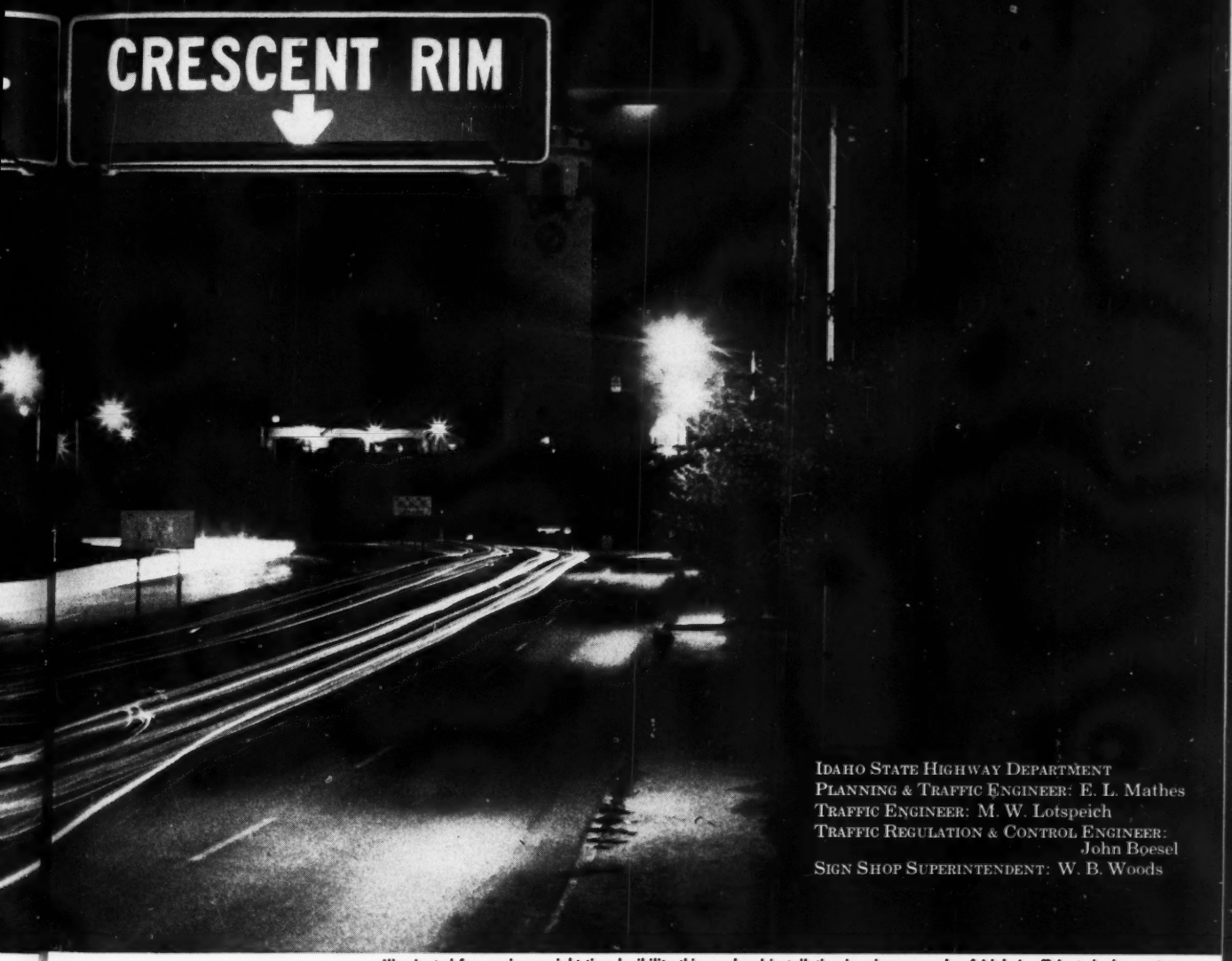


IDAHO STATE HIGHWAY DEPARTMENT
PLANNING & TRAFFIC ENGINEER: E. L. Mathes
TRAFFIC ENGINEER: M. W. Lotspeich
TRAFFIC REGULATION & CONTROL ENGINEER: John Boesel
SIGN SHOP SUPERINTENDENT: W. B. Woods

**Illuminated for maximum night-time legibility this overhead installation is prime example of Idaho's efficient signing system.**

OVER 7,000 MODERN OVERLAID PLYWOOD SIGNS of every type and size help make motoring a pleasure on Idaho's scenic highways. They also help the state highway department do a better signing job at considerable savings to taxpayers.

Until 1953, when Idaho switched to High Density overlaid plywood, maintenance and repair had been a constant problem. Weathering is unusually severe; temperature ranges from 115° above to 40° below zero. Vandalism damage from hunters in isolated areas and resultant progressive deterioration were particularly troublesome. Under these rugged conditions, overlaid plywood has performed consistently well—particularly in areas where signs are subjected to unusual abuse. As a result, maintenance costs have dropped sharply.

Initial fabrication and installation costs are also less. Records at the Idaho sign shop in Boise show a completed overlaid plywood sign costs between 10 and 15 percent less than aluminum.

**DOUGLAS FIR PLYWOOD ASSOCIATION**
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—a non-profit industry organization devoted to research, promotion and quality control

DFPA TESTED QUALITY

# New Equipment and Methods

**Publication of product announcements in this section should not be construed as endorsement or approval by the Institute of Traffic Engineers**

## Ultra-Sonic Vehicle Detector

The Vehicle Traffic Control Division (VTCD) of the General Railway Signal Company, Rochester, New York, announces development of its new Ultra-Sonic CHEKAR Type SVDM Direction/Motion Vehicle Detector which incorporates revolutionary features.

Developed in the VTC Division's long-range product and marketing operations the new CHEKAR SVDM product applies the modern sciences of electronics and ultra-sonics (inaudible or "super-sonic" sound waves) in accurately distinguishing between approaching and receding vehicles, long a major problem in the automatic actuation of vehicle traffic signals and signs.

The new SVDM equipment detects only moving vehicles from maximum road speeds to as low as four miles-per-hour, yet provides maximum immunity to receding vehicles which may enter the SVDM's detection zone. This unique performance advantage gives high protection against "false" signals or sign "calls" by departing vehicles.

A choice of mounting methods—over the road, or at side of road, is available, depending on job requirements. Detection is effective up to two standard size road lane widths. Easy, simple, low-cost installation and maintenance . . . requiring no Federal Communications Commission (FCC) licenses or special tools or special component parts . . . are designed into the product.

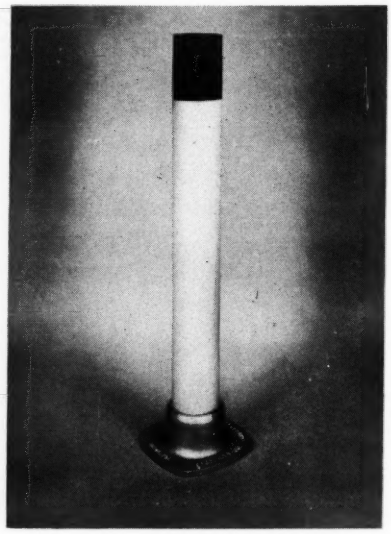
VTCD officials state the new SVDM "will be priced very competitively," and will "be available for delivery through franchised distributors about January 1, 1962."

**General Railway Signal Company, Rochester, N. Y.**

## Safe-T-Post Available

After years of research and test, Radiator Specialty Company in Charlotte, N. C., presents the original Safe-T-Post.

All modern technical and scientific resources have been combined to create the ultimate in a traffic delineator—to give traffic authorities a modern, safe and simple way of guiding traffic. Minute-quick installation for years of service.



The Safe-T-Post is made of a special Poly-Vinyl—tough as can be—yet retaining its smooth flexible finish when hit. When bent, or run over, it snaps back immediately to its original upright position. This special Poly-Vinyl will outlast any rubber-material five to one, or better.

The color is a solid bright yellow clear through. No paint to fade, peel off or crack. When dirty, water and any detergent will make it bright yellow, as good as new again.

A grey, iron base, painted with aluminum rust retardant paint, gives a solid foundation.

Installation is minute-quick, either with expansion-bolts, a studgun or just epoxy mastic. The Poly-Vinyl tube can easily be replaced when damaged.

**Radiator Specialty Company, Charlotte, North Carolina.**

## New Patented Counter Actuator

Accurate Products Company Inc., reports it has solved the failure problem in usage of the standard rubber traffic counter hose.

Until recently, the only available counter hose has been the completely round tubing with a 3/16" or ¼" ID by 9/16" OD. This has been available in synthetic and natural rubber compounds and due to the shape, especially in high speed traffic conditions, the hose would tend to roll under the wheels at point of impact. This sets up internal stresses in the rubber itself so that the tubing actually would wear from the inside outward.

This in turn would either mean frequent replacement of tubing under hazardous highway conditions, or incorrect traffic counts. The continued danger and high labor costs made this impractical to continue.

Accurate Products Company, Inc., then undertook the problem, and in close cooperation with the state of California developed a totally new designed shape and a new compound (E-160) that has withstood severe testing at high speed on highway 101 in San Diego County. The Federal government is also conducting tests of this new product.

The new patented design is semicircular with a serrated concave bottom section which provides a far greater area of contact to the road surface. At the point of impact the movement is very slight, and since the pressure is usually downward, the fatigue life of the new counter is many times greater than the round tubing.

To replace the customary round hole an oblong hole is used which directs the lines of stress downward and outward to a greater body of rubber. Special clamps are also offered by the manufacturer.

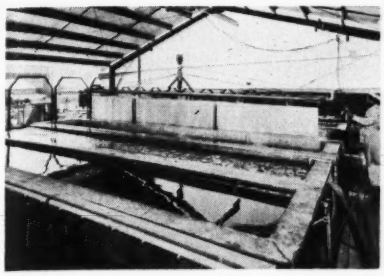
**Accurate Products Company, Inc., 4650 Santa Fe Street, San Diego, Cal.**

## Cameo Boosts Facilities

Installation of a new 7-tank pickling system for aluminum products now enables California Metal Enameling Company to treat aluminum sheets and extrusions up to 25 feet in length.

These tanks, coupled with a recently installed continuous furnace, make it possible for Cameo to fuse permanent color on highway signs in single sheets of aluminum up to 25 feet in length by 5 feet in width. The new tanks have speeded the preparation of all aluminum for enameling. Color on highway signs, advertising signs and neon displays is fused directly to the aluminum and guaranteed to last a lifetime. Cameo is said to have the widest color range available of any metal enameling firm.

Porcelain enamel finishes on aluminum are now less costly than other competitive finishes, according to H.



**Aluminum sheets or extrusions up to 25′ in length can now be prepared for porcelain enameling in new 7-tank pickling system developed by California Metal Enameling Company engineers. Firm is this year observing 50th anniversary.**

V. Penton, Cameo president. Penton said the lifetime properties of porcelain enameling make it the least expensive finish for any exterior aluminum, and that production line automation at Cameo has further reduced costs of treating this metal.

Each of the 7 tanks in the pickling line has a capacity of 3200 gallons, and measures 26′ x 3′ x 6′. Paul Kates, Cameo ceramic engineer with a 30-year background in the metal enameling field, developed the new tanks and pickling system to provide the highest degree of cleanliness and uniformity in the surface to be porcelain enameled. He said through years of research, the firm has found that quality preparation of the aluminum prior to enameling is a key factor in achieving the intimate and lasting bond of the porcelain finish that makes it a lifetime finish.

Aluminum parts are first immersed in a cleaner bath, then triple rinsed with spray, immersed and finally rinsed with another spray. Parts are then immersed in an "R-100" bath triple rinsed, given an acid chrome conversion, triple rinsed a final time and dried.

**California Metal Enameling Company, 6904 East Slauson Ave., Los Angeles, California.**

## New Traffic Sign Catalog

Gopher Stamp & Die Co. has announced completion of a new 4-color, 32-page sign catalog. The catalog lists and pictures more than 450 items, including stop, regulatory, school, warning, construction, directional and guide signs; rural fire, railroad and street name signs; delineators and numerous utility and accessory items.

All signs are available in choice of aluminum or die-embossed steel, reflectorized or non-reflectorized.

**The catalog, along with complete price list and order forms may be obtained free of charge by writing Gopher Stamp & Die Co., Chicago Ave. at Custer St., St. Paul, Minn.**

## Safety Lane Markers

New, easily stored and carried Traffic Safety Lane Markers are now being made by Stokes Molded Products, Trenton, N. J. Exceptionally low in cost, the markers are a revolutionary new design having interchangeable yellow tubes set in a separate, heavy 10″ square molded base. The tubes are made in heights from 12″ to 72″ in increments of 12″ and have excellent visibility, particularly in the tall sizes. The colors are molded in for permanency; cannot wear or flake off—and the units have good impact resistance.

Stokes Traffic Safety Lane Markers occupy little space, less than conventional cones; are easily carried in car trunks by highway crews, and by police for emergency use at the scene of accidents. For lining highways, road construction and repair, twice the number of Stokes markers can be used at less cost than for the usual markers; double the safety factor, greater economy. Units will accommodate presently-used, standard accessory flags, warning signs or flashing lights. More complete information and prices available on request.

**Stokes Molded Products, Trenton, New Jersey.**

## New Publications

### Quality and Theory of Traffic Flow

Symposium by Bruce D. Greenshields, Henry P. George, Neil S. Guerin, M. Ross Palmer, and Robin T. Underwood. Yale University Bureau of Highway Traffic, Strathcona Hall, New Haven, Conn. 1961. 188 pp.

The five papers contained in this publication were developed by staff and students at the Yale Bureau of Highway Traffic from 1954 to 1960. The first two papers are concerned principally with service to the road user. The other three papers are concerned with the theory of traffic flow, but are closely related to the subject matter of the first two papers. The five papers together are offered, according to the foreword, to stimulate further thinking and research in these areas.

### Theory of Traffic Flow

Edited by Robert Herman. Distributed in U. S. by D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, N. J. 1961. 238 pp. $8.75.

This book contains the proceedings of the symposium on the theory of traffic flow held at the General Motors Research Laboratories on December 7 & 8, 1959. Fifteen papers in all are presented in the volume, fourteen having been scheduled at the meeting. The other is an amplified version of discussion at the meeting by one of the participants.

### Motor Vehicle Time and Fuel Consumption

Bulletin 276, Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. December 1960. 91 pp. $2.00.

This bulletin contains three papers presented at the 39th Annual Meeting of the Highway Research Board, as follows:

"Fuel and Time Consumption Rates for Trucks in Freight Service," by Malcolm F. Kent, reports the results of cooperative fuel and time consumption studies on highway freight carriers under various conditions of operation.

"Time and Fuel Consumption for Highway User Benefit Studies," by Paul J. Claffey, reports on a Bureau of Public Roads study of fuel and time consumption of passenger cars and single-unit trucks under varied operating conditions.

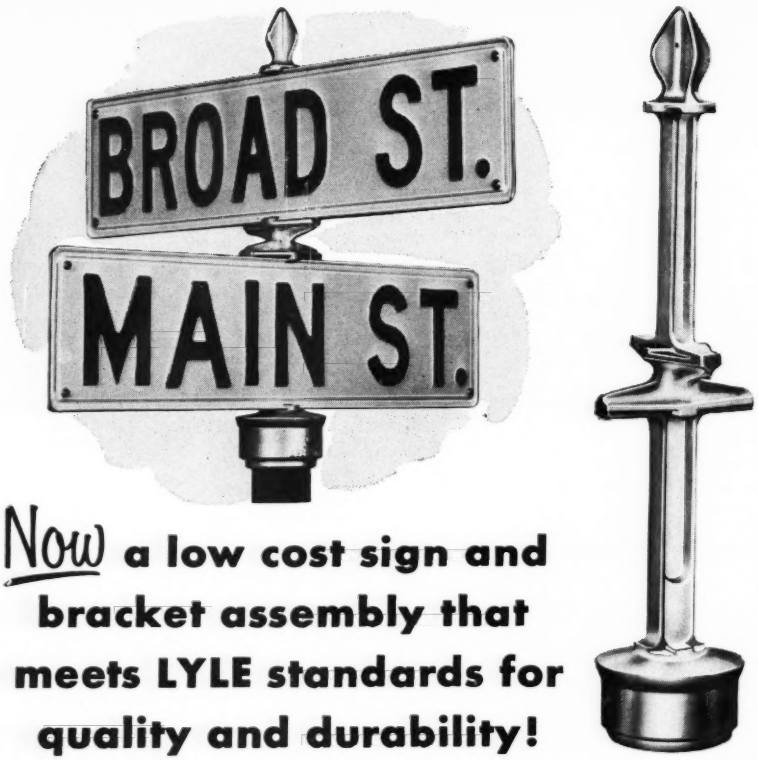
"Motor Transport Fuel Consumption Rates and Travel Time," by Roy B. Sawhill and Joseph C. Firey, reports the results of a study of time and fuel consumption by several gasoline-diesel-powered line-haul vehicle types under varying conditions of grade, speed, weight, stopping and slowing.

### Traffic Volume and Speed Studies

Bulletin 281, Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. January 1961. 96 pp. $2.00.

This bulletin presents five papers presented at the 39th Annual Meeting of the Highway Research Board, as follows:

"Estimating the Daily Vehicle-Miles of Travel in the Chicago and Pittsburgh Metropolitan Areas," by Louis E. Keefer.




**Now a low cost sign and bracket assembly that meets LYLE standards for quality and durability!**

Caught in a squeeze between quality and price in your street signing program? Here's your answer! LYLE has developed a special one-piece alloy aluminum bracket assembly, to give you a lower purchase price and lower installation cost. The bracket is matched to LYLE's standard style name plates (it contains magnesium for greater tensile strength without brittleness) and is an important addition to LYLE's wide variety of highly readable sign styles and exceptionally durable materials.

***LYLE SIGNS STILL SPARKLE LIKE NEW AFTER YEARS OF SERVICE!***

LYLE craftsmanship and quality control puts extra long life into every sign. Many "old-timers" are still in service because they look like new and there's just no need to replace them! (Incidentally, LYLE keeps all patterns and dies in stock so it's easy to expand your sign program without loss of uniformity 15 to 20 years hence.)

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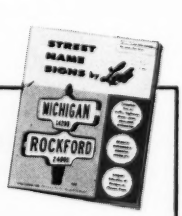


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"Estimating Traffic Volumes by Systematic Sampling," by Thomas Muranyi.

"Volume and Speed Characteristics at Seven Study Locations," by Frederick A. Wagner, Jr., and Adolph D. May, Jr.

"Sample Size Requirements for Vehicular Speed Studies," by J. C. Oppenlander, W. F. Bunte, and P. L. Kadakia.

"Variability of Fixed-Point Speed Measurements," by Robert P. Shumate and Richard F. Crowther.

### Freeway Operations

Bibliography 28, Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. 1961. 14 pp. $0.60.

This bibliography, prepared by the Committee on Freeway Operations of the Department of Traffic and Operations, lists 165 articles and publications, which are classified under headings of operational studies, simulation of traffic flow, electronic instrumentation and devices, design considerations, and miscellaneous freeway references. The miscellaneous classification includes sub-sections dealing with effect on surface streets, economic considerations, statistical applications, accident studies, and signing.

### Accident Facts: 1961

National Safety Council, 425 N. Michigan Avenue, Chicago 11, Illinois. 1961. 96 pp. $1.85.

The annual statistical summary of accidents in the U. S., plus some non-U. S. data. Thirty-two pages are devoted to traffic accidents.

### Atlanta Region Comprehensive Plan: Rapid Transit

Atlanta Region Metropolitan Planning Commission, 900 Glenn Building, Atlanta 3, Georgia. June 1961. 32 pp. $2.50.

This illustrated report presents in attractive fashion a proposal for a rapid transit system for the five-county area of which Atlanta is the center. Treated are the metropolitan region, basic concepts about the region and transportation, the recommended plan, and suggestions for carrying out the plan.

### Motor Truck Facts—1961

Automobile Manufacturers Association, New Center Building, Detroit 2, Michigan. 1961. 56 pp.

The annual facts booklet of the manufacturers dealing with motor truck production, registration, and use.

# Technical Notes

## SATURDAY PARKERS IN BUSINESS AREAS OF RICHMOND, VIRGINIA

By S. T. Baker, Jr., Acting Traffic Engineer
and
W. F. Thomas, Assistant Traffic Engineer, Richmond, Va.

Parking in the central business district of Richmond has for many years been of major concern to the shopper, the worker and the merchant. In today's economy one of the main prerequisites for a healthy and prosperous business district is an adequate supply of parking spaces. These must be conveniently located and near the core of the business generators. It has been proven that the motorist, and particularly the shopper, will not walk more than three blocks from the parking area to his ultimate destination. These statements apply not only to the Central Business District but also to any outlying shopping area.

A suggestion was presented to the City Administration that free, unrestricted curb parking be allowed on all Saturdays in the various business areas within the city that have either parking meters or time limit regulations. In order to present an authoritative report, the Bureau of Traffic Engineering conducted a curb parking survey on Saturday, April 29, 1961. The study included the central business district, the Cary Street shopping area, the Hull Street shopping area and the area at Boulevard and Broad Street. It is the purpose of this report to explain in detail the results of the survey and to point out for consideration several of the major issues involved in this subject.

### Method of Study

In order to present a complete cross section of the Saturday parking habits three methods of study were used. The first consisted of a personal interview with the driver of the vehicle at the time that he parked in a curb space. Each interview station consisted of one block face which had an average of 13 curb parking spaces. There was a total of eight such stations, five in the central business district, one in the vicinity of Boulevard and Broad Street, one in the Cary Street shopping area and one in the Hull Street shopping area.

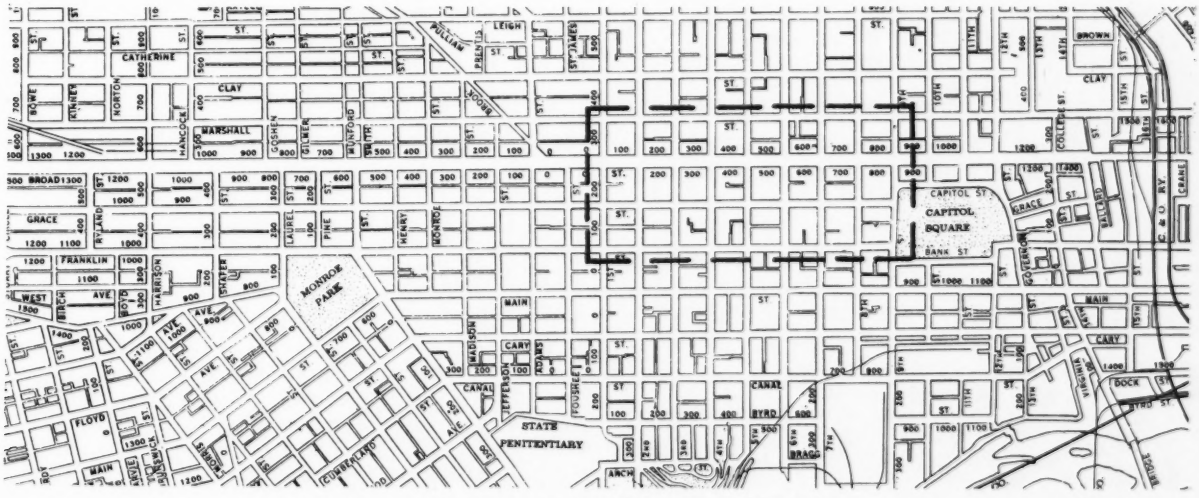
The second method of study was a curb parking occupancy survey which was conducted exclusively in the central business district. This consisted of surveying 41 block faces every 15 minutes to determine the amount of parking turnover per space. Each parked vehicle was observed and the time that it remained parked in that particular space was recorded in increments of 15 minutes for the entire 10 hour period. The area in this phase of the study was bounded by Leigh Street, Main Street, First Street and Ninth Street.

The third method dealt with the amount of revenue received from parking meters on Saturday as compared with that of an average weekday. A collection was made from 138 parking meters in the central business district after 6:00 P.M. on Friday, April 28, 1961. This included the total revenue for a four-day period, Tuesday through Friday. However, in order to be more meaningful an average figure for the four weekdays was used for comparative purposes. A similar collection from the same meters was made on Saturday, April 29, 1961. This contained only the money received for that particular day.

The survey was conducted between the hours of 8:00 a.m. and 6:00 p.m. All of the areas included within the study had one-hour parking meters along the curb face with the exception of Hull Street. At that location one-hour time limits were in effect. The weather was clear and mild throughout the day; therefore, the parking habits which were observed on April 29, 1961 are considered to be those of any normal Saturday.

### Summary of Results

During the ten hour survey period, 1,042 vehicles parked along the block faces that comprised the eight interview stations. These included the central business district as well as the three outlying areas. It is significant to note the parking trends from 0 to 60 minutes, which are expressed in tabular form in Table I.




Survey Area—Central Business District, City of Richmond.

TABLE I

| Total Number of Vehicles Parked At All Interview Stations—10 Hour Period — | 1,042 | Percentage Of Total |
|---|---|---|
| *Number of Vehicles Parked* | | |
| 0 to 15 Minutes | 438 | 42.03 |
| 16 to 30 Minutes | 223 | 21.40 |
| 31 to 45 Minutes | 129 | 12.38 |
| 46 to 60 Minutes | 82 | 7.86 |
| 60 Minutes and Over | 170 | 16.33 |
| Total | 1,042 | 100.00 |

The figures indicate a demand for short-time curb parking in each of the business areas studied.

The average turnover rate for the eight interview stations was 10.21 vehicles per space throughout the 10-hour period. This varied from a turnover rate of 5.9 on the west side of Fifth Street between Franklin Street and Grace Street to a 17.76 turnover rate on the north side of Broad Street between the Boulevard and Terminal Place. At the Fifth Street location 60.24 per cent of the total vehicles parked for one hour or less while on Broad Street the figure was 99.56 per cent.

It is interesting to note that of the 1,042 vehicles that parked, 1,011 of their operators were interviewed. There were 31 vehicles which were missed by the interviewers. Of the total number that were interviewed, 715 or 70.7 per cent stated that their trip purpose was to shop.

In order to compare the use of parking meters on Saturday with that of a weekday, the amount of money collected was used as a guide. The revenue collected for the period Tuesday through Friday is shown as well as the average for this four day period. These figures were then compared with the money received from the same meters on Saturday. The comparisons are listed in Table II.

Assuming that every parker who deposited a nickel in the meter remained in the space for one hour, the turnover rate for these 138 spaces would be 8.4 during a week-day and 6.9 for Saturday.

A number of parkers had a choice whether or not to insert coins in the meters at the time they parked. These were motorists who parked in a metered space in which the time on the meter had expired, and they had the choice of depositing or not depositing a nickel. This phase of the survey showed that 330 parkers inserted a coin in the meter at the time they parked as compared to 314 that did not. This information was obtained on a Saturday and indicates an observance of time limits even though a large percentage of the people are aware that enforcement on Saturdays is not as strict as on weekdays.

During the curb parking occupancy portion of the study, 41 block faces were surveyed every 15 minutes throughout the entire 10-hour period. On 31 of these blocks the average time parked was for one hour or less, while on the remaining 10 blocks the motorist parked for an average time exceeding one hour. Throughout the day 3,197 vehicles parked along these block faces. Thus, the average time parked for the entire 41 blocks was 49 minutes per vehicle per space.

To point out the divergence of usage in curb parking within the same block face the following two conditions are cited. A vehicle parked in meter space number 1 on the north side of Marshall Street between Fifth Street and Sixth Street at 9:30 a.m. It remained in the same space until 6:00 p.m. During the same period of time 15 vehicles parked in meter space number 4. This of course gives a vivid comparison of turnover versus the all-day parker. It also indicates the use that may be realized from one curb parking space if it is properly used and enforced.

Observations were made on a number of streets just outside of the central business district study area to determine the patterns of parking in these so-called fringe areas. There was a high percentage of overtime parking as compared to the total number of vehicles parked. The Richmond Parking Survey—1960, prepared by the Virginia Department of Highways, indicates that the worker and the person in the process of conducting business will walk a greater distance to their destinations than the shopper. Based upon these facts it is assumed that the majority of the violators were not shoppers but rather people in the other two groups mentioned above.

During the Saturday survey there were 415 curb parking spaces studied. Throughout the day 4,239 vehicles parked in these zones. Should free unrestricted parking be permitted, there is a possibility that only 415 vehicles would be able to—or would have the opportunity to—park in the original 415 spaces. This condition would of course be brought about by the spaces being filled early in the morning with all-day parkers. Although the assumption may be somewhat theoretical it should not be considered as being impossible.

## Conclusion

The curb parking survey indicated a strong demand for short-time parking in the core areas. This is true in both the central business district as well as the three outlying areas. The average parking time of 49 minutes per vehicle per space and the average turnover rate of 10.21 vehicles point out the need for accommodating the short-time parker at the curb. Parking meters are one of the recognized methods for accomplishing this purpose.

The survey revealed that the majority of the parkers interviewed were in the area for the purpose of shopping. If free unrestricted parking were allowed it would seem reasonable to assume that at least a portion of the curb spaces would be occupied by people working in the area. Thus, the number of available spaces for the shopper would subsequently be reduced. This in turn deprives the merchants of a number of potential customers which would adversely affect the economic well being of the business district.

A recent study of the traffic charac-

TABLE II

| | Total Collected | Average Per Day | Average Per Meter |
|---|---|---|---|
| Tuesday through Friday | $231.87 | $57.97 | $ .42 |
| Saturday | $ 47.52 | $47.52 | $ .344 |

teristics at regional shopping centers conducted by the Bureau of Highway Traffic, Yale University, indicated that the average time parked on Saturday was for one hour and five minutes. However, the majority of these people parked for less than one hour. The parking areas in the centers are unrestricted except for the all-day parkers who are prohibited. In the central business district of Richmond there are 538 two-hour parking meters for those who want to remain at the curb for a period longer than one hour.

It should be noted that any additional enforcement of the time limit regulations would add to the availability of the curb parking in the various business areas. This would be beneficial both to the merchant and to the motorist.

This Bureau recommended the retention of the present parking regulations in the downtown area. This is based not only upon the results of the survey but also upon recognized traffic engineering practices. It is felt that the present parking patterns are an aid to the economic well being of the business area.

## Coming Events

**October 9-13—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—**
47th Annual Meeting, Denver Hilton Hotel, Denver, Colorado. Contact: AASHO, 917 National Press Bldg., Washington 4, D. C.

**October 15-18—AMERICAN TRANSIT ASSOCIATION—**
Annual Meeting, Baker and Adolphus Hotels, Dallas, Texas. Contact: ATA, 355 Lexington Avenue, New York 17, N. Y.

**October 16-19—NATIONAL SAFETY CONGRESS AND EXHIBITION—**
Congress, Conrad Hilton, and other hotels, Chicago, Ill. Contact: NSC, 425 N. Michigan Ave., Chicago 11, Ill.

**October 16-20—AMERICAN SOCIETY OF CIVIL ENGINEERS—**
Annual Convention, Hotel Statler, New York City. Contact: ASCE, 33 West 39th Street, New York 18, N. Y.

**November 27-30—SOUTHEASTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS—**
Annual Convention, Hotel Marion, Little Rock, Ark. Contact: Raif M. Smith, c/o Arkansas State Highway Dept., Little Rock, Ark. 1962

**1962**

**January 8-12—HIGHWAY RESEARCH BOARD—**
Annual Meeting, Sheraton-Park Hotel, Washington, D. C. Contact: HRB, 2101 Constitution Ave., Washington 25, D. C.

**February 2-9, 1962—NORTHWEST ROADS AND STREETS CONFERENCE—**
(Formerly the NW Highway Engineering Conference) Oregon State University, Corvallis, Oregon. Contact: B. J. McClarty, Secretary, NW Roads & Streets Conference, c/o Bureau of Public Roads, 720 SW Washington St., Portland, Oregon.

**March 5-23—TRAFFIC ENGINEERING SEMINAR**
Sponsored jointly by Northwestern University and Midwest Section, ITE, at Evanston, Illinois. Tuition $225. Contact: N.U. Traffic Institute, 1804 Hinman Ave., Evanston, Illinois.

**August 13-16—INSTITUTE OF TRAFFIC ENGINEERS—**
32nd Annual Meeting. Denver-Hilton Hotel, Denver, Colo. Contact: ITE, 2029 K St. NW, Washington 6, D.C.
Rock, Ark. 1962
5, D.C.

**October 14-20—INTERNATIONAL ROAD FEDERATION—**
World Meeting, Madrid, Spain. Contact: IRF, 1023 Washington Bldg., Washington

# Institute Affairs

## Gravelle Named ITE President for 1962; Hurd Elected Secretary-Treasurer

Gordon Gravelle, Deputy Commissioner of Traffic, New York City, was elected President of the Institute of Traffic Engineers at the Annual Meeting held in Washington in August. Named as Vice Presidents were Robert A. Burch, State Traffic Engineer, North Carolina State Highway Commission, and J. Al Head, Assistant Traffic Engineer, Oregon State Highway Department.

Elected to the post of Secretary-Treasurer was Fred W. Hurd, Director, Yale Bureau of Highway Traffic. Mr. Hurd was opposed by George W. Howie, Director of Public Utilities and Traffic for the City of Cincinnati, and won in a close race. Mr. Hurd received 355 votes and Mr. Howie 321 votes, according to the tellers committee. Chairman of the tellers group was Randolph T. Gregory of Waco, Texas, and assisting him were Grant A. Bacchus of Toronto and John A. Bruce of Denver.

Three Directors were elected at the meeting. L. E. Bender of the Port of New York Authority was elected Director for District 1, Armand E. Keeley of Huntingdon, Pennsylvania was elected Director for District 2, and Joseph J. Feuchter of St. Louis was elected Director for District 4. The race in District 4 was the only contested one, and Mr. Feuchter received 72 votes, winning over Herman Batts with 22 votes and Daniel J. Hanson with 1 vote.

All terms of office of the newly elected officers and directors will begin January 1, 1962, according to the amendments approved last year in the Institute's By-Laws. The officers will serve a twelve-month term, and the three directors will serve for two years.

Continuing on the Board of Direction for 1962 will be Herbert B. Woodling of Akron, Director for District 3; Fenton G. Jordan, Jr. of Norfolk, Director for District 5; and A. L. Hutchison of Los Angeles, Director for District 6. Also a member of the Board of Direction in 1962 will be the immediate Past President, who is A. F. Malo of Detroit.

## Board of Direction Meets in Washington

The Board of Direction of the Institute of Traffic Engineers met in Washington on Saturday and Sunday, August 19 and 20, with all members of the Board present. The following significant actions were taken by the Board:

1. A total of 186 membership cases were reviewed. The Board approved 108 new members (60 Juniors, 46 Associates, and 2 Members) and transferred 48 members to higher grades (36 to Associate Member and 12 to Member). Sixteen cases (14 new applicants and two transfers) were declined, and 14 cases were set aside until the January meeting for various reasons.

2. The allocation of funds from the Technical Development and Research Fund to two projects, one at the University of California, and one at Texas A & M, was approved. More details on this are contained in an accompanying story.

3. The concept of a charter for local sections, replacing the present varying constitutions that have been adopted individually by sections, was approved and a standard form was adopted. On the debatable question of local section affiliates, the Board voted to permit local section affiliates if desired by the section, but established a limitation on local section affiliates who were en-

gaged in commerce and industry of 50% of the total Institute membership in the local section.

4. The Board considered a suggestion that the Institute sponsor in 1962 a series of traffic engineering administration and management conferences, and named a special committee to look further into the subject to determine the practicability of such a series.

5. In response to a question from the American Public Works Association, the Board agreed to co-sponsor with APWA and AASHO a revision and republication of the earlier report "Traffic Engineering Functions and Administration."

6. The President was authorized to appoint a committee dealing with the subject of labor unions and engineers with instructions to the committee to maintain a continuing review of this subject and make periodic reports to the Board of Direction.

7. A report of the Traffic Engineering Services Committee was accepted and Board approval was given to the adoption of EJC report number 106 as a statement of Institute policy in this area. The committee will continue its work, with a report expected in January on specifications on types of services and qualifications of traffic engineering consultants.

8. The Traffic Engineering Handbook Editorial Board reported that progress was continuing on the new edition of the handbook, with a promise that material would be ready for the printer by January 1, 1962, and that publication would be complete in the spring of 1962.

9. The Board authorized the publication of a new pamphlet entitled "Careers in Traffic Engineering" provided matching funds are made available for this purpose by the Insurance Institute for Highway Safety.

10. Acting on a recommendation from the Technical Council, supported by an opinion from the Policy Committee, the Board decided to authorize the President to name a chairman of the Technical Council who would serve for a three-year term. One of the Vice Presidents of the Institute would continue as an ex-officio member of the Technical Council and would provide liaison between the Technical Council and the Board of Direction.

11. The site of the 1964 annual meeting was set as Miami Beach, Florida, and the hotel identified as the Deauville. The exact date of the meeting was left open, pending a determination of possible conflicts with meetings of other organizations.

12. A report from the special committee studying the subject of ITE awards was approved by the Board as Institute policy. The report recommended: (a) the Institute should continue its support of the National Safety Council's Annual Inventory Program; (b) as long as awards are given for other sections of the inventory, the traffic engineering section should be similarly recognized, and (c) the Institute of Traffic Engineers should not itself make awards for the traffic engineering section of the inventory.

## Resolutions Adopted at 1961 Meeting

### RESOLUTION No. 1

*World Traffic Engineering Conference*

WHEREAS, the International Sessions of the World Traffic Engineering Conference are being held in Washington, D. C., on August 24-26, 1961; and

WHEREAS, the Institute of Traffic Engineers recognizes the professional advantages being derived from the mutual exchange of information between the traffic engineers of all nations and is acting as co-sponsor of this meeting; now therefore be it

RESOLVED that the Institute of Traffic Engineers expresses its sincere appreciation to all who are participating, and have given so freely of their time and efforts toward making this meeting an outstanding success.

### RESOLUTION No. 2

*Implementing and Applying Manual On Uniform Traffic Control Devices*

WHEREAS, the Manual on Uniform Traffic Control Devices for Streets and Highways has recently been revised by the National Joint Committee on Uniform Traffic Control Devices in which the Institute of Traffic Engineers has participated as an organization and through its members; and

WHEREAS, uniformity in the design and application of traffic control devices throughout the nation would reduce accidents and improve traffic flow by removing causes of driver confusion and uncertainty; and

WHEREAS, members of the Institute of Traffic Engineers are in a position to further the progress of the states, municipalities, and other governmental units toward uniformity in the design and application of traffic control devices; now, therefore, be it

RESOLVED that the governing body of every governmental unit be urged to implement and accelerate progress toward such uniformity in the design and application of traffic control devices by appropriate administrative and legislative action.

### RESOLUTION No. 3

*Encouragement of Continued Research By Members of ITE*

WHEREAS, the Institute of Traffic Engineers is one of the participating agencies in the review of the Manual on Uniform Traffic Control Devices; and

WHEREAS, the Joint Committee on Uniform Traffic Control Devices is taking steps toward increasing participation in the research, to improve design, warrants, and application of traffic control devices; now, therefore, be it

RESOLVED that the Institute of Traffic Engineers, through its members and particularly the local sections, increase its participation in areas of research, needed by the Joint Committee on Uniform Traffic Control Devices; and be it further

RESOLVED that the Institute of Traffic Engineers make available to the Joint Committee on Uniform Traffic Control Devices, the results of all research in design, warrants and application of traffic control devices; and be it further

RESOLVED that the Institute of Traffic Engineers recommend the prompt utilization of significant traffic engineering research through revision or supplement to the Manual on Uniform Traffic Control Devices.

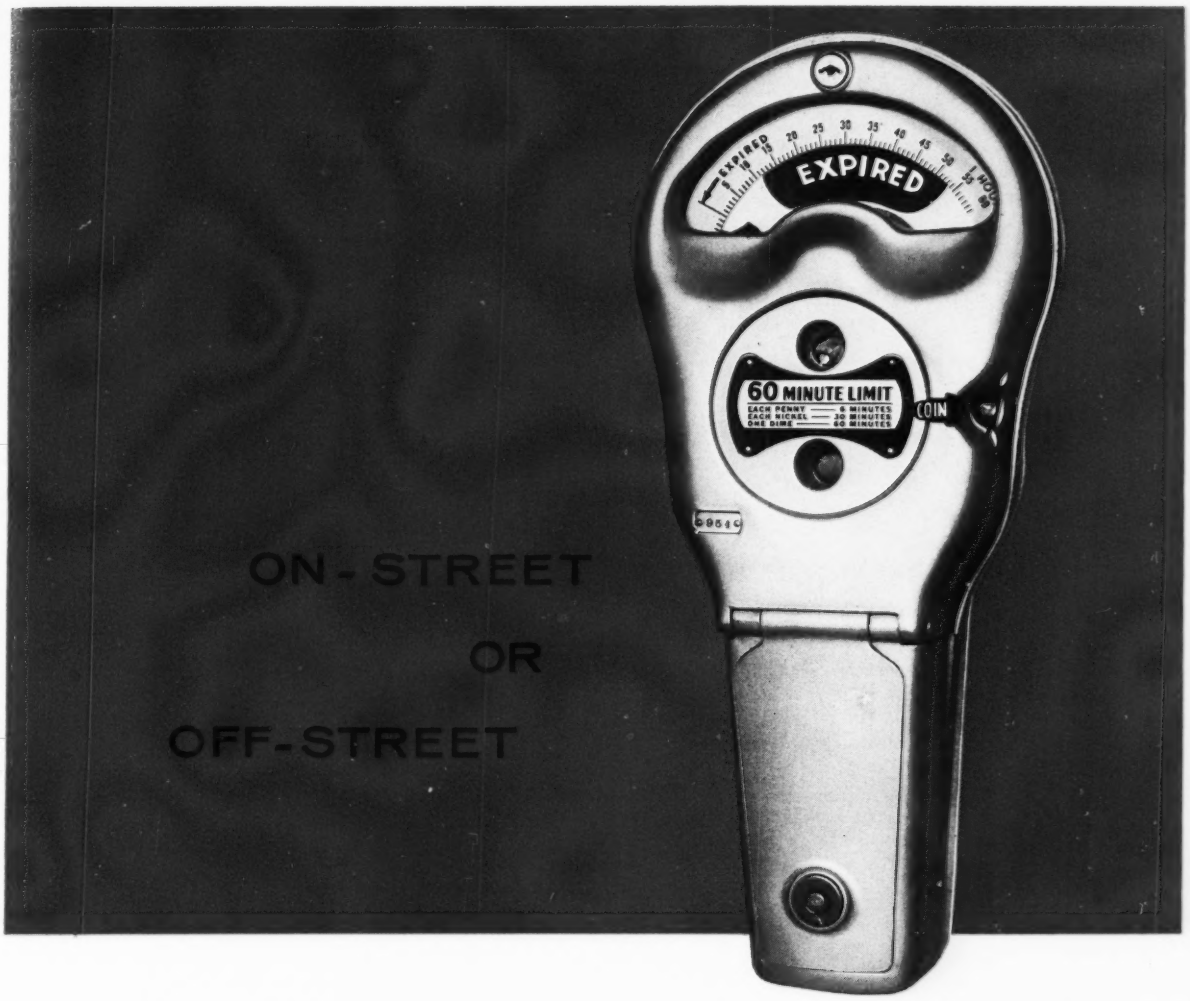
### RESOLUTION No. 4

*Traffic Safety Action Program*

WHEREAS, the Nation's welfare is fundamentally dependent upon highway transportation; and

WHEREAS, the traffic engineer's contribution to safety and efficiency of highway transportation is basic and indispensable; and

WHEREAS, the President of the United States has emphasized the National importance of safety on streets and highways through his support of the President's Committee for Traffic Safety; therefore, be it

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RESOLVED that the Institute of Traffic Engineers expresses its desire to continue its support of the Revised Action Program of the President's Committee for Traffic Safety as an effective method of achieving greater safety in our highway transportation system.

### RESOLUTION No. 5

*Appreciation to Annual Meeting Committee*

WHEREAS, the program of professional and technical meetings and papers at this 31st Annual Meeting of the Institute of Traffic Engineers is contributing substantial technical information to those in attendance and is both stimulating and impressive in achieving the objectives of the Institute; and

WHEREAS, the large amount of time and effort devoted to the arrangements of accommodations and activities for this meeting by the general chairman and sub-committees and members are recognized and appreciated; therefore, be it

RESOLVED that the Institute of Traffic Engineers expresses its sincere appreciation to Burton W. Marsh, General Chairman of the Local Arrangements Committee and to the chairmen and members of the sub-committees and their wives, and to others including business and industry groups who gave so freely and willingly of their time and efforts toward achievement of the outstanding success of this Annual Meeting.

### RESOLUTION No. 6

*Appreciation To Retiring Board Members*

WHEREAS, the great strides made by the Institute of Traffic Engineers during the year 1961 are largely due to the untiring and conscientious efforts of its officers and directors, and particularly to the leadership of Alger F. Malo who has served many years as director and officer, and is serving during 1961 as president; now therefore be it

RESOLVED that the membership of the Institute on this occasion, the 31st Annual Meeting, hereby expresses its deep and sincere appreciation to him for his accomplishments during his year as President and for his many years as officer and director, and for his contribution and devotion to the advancement of the profession of traffic engineering; and be it

FURTHER RESOLVED that the membership of the Institute also hereby expresses its appreciation to the directors who will retire at the end of this year, O. K. Normann, Fred W. Hurd and Evan K. Olmstead, for their serious and conscientious efforts in promoting the welfare of the Institute, and to the immediate past president, Edward G. Wetzel, for the work he has done.

### RESOLUTION No. 7

*Appreciation To Overseas Members and Guests*

WHEREAS, the 31st Annual Meeting of the Institute of Traffic Engineers is being held in Washington, D. C., on August 21-23, 1961; and

WHEREAS, the Institute of Traffic Engineers recognizes the value of interchange of information between traffic engineers of all countries; now therefore be it

RESOLVED that the Institute of Traffic Engineers wishes to express its appreciation to all its overseas members and to those persons engaged or interested in traffic engineering from other countries who have taken the time to attend and are contributing materially to the success of this 31st Annual Meeting.

## Report of the President

**31st ANNUAL MEETING**
**Institute of Traffic Engineers**
**Washington, D. C.**

In my first news letter to the membership, I included some personal comments regarding progress of the Institute during my term of office. I believe I implied that I had no specific plans for revamping the Institute but I was extremely interested in seeing it continue to improve as it has been doing for a number of years. With the World Traffic Engineering Conference scheduled, there had to be a great deal of work done by many members of the Institute and had I suggested any other specific comprehensive projects, I believe I would have been extremely unpopular. Looking back over the year I find that we have again increased in membership and having reviewed this week with the Board 186 new applications or transfers in membership, I am firmly convinced that our organization is a sound one and that we will continue to expand our membership activities in the years to come. Looking back over the year I find in addition to the World Traffic Engineering Conference, we have made good progress in other directions.

#### Freeway Operations

Last year your President reported on the successful freeway seminars. This year we published the booklet "Freeway Operations" which reports the major findings of these meetings. When I say we published, I mean, of course, with the aid of Automotive Safety Foundation funds and staff time. I think it is entirely proper at this time to give credit to Carlton Robinson, who almost single handedly prepared this booklet.

#### Manual on Uniform Traffic Control Devices

During this year we saw the completion, approval and now publication of the new manual. This was prepared by a committee of 25, of whom 17 are ITE members. The manual is sponsored jointly by the Institute of Traffic Engineers, the American Association of State Highway Officials, the National Committee on Uniform Traffic Laws and Ordinances, the American Municipal Association and the National Association of County Officials. The publishing and use of this manual should result in more complete standardization of the use of traffic control devices throughout the country. I am pleased to note that the Joint Committee has set up a plan for periodic review and revision of the Manual, based on the results of engineering research. This is to be implemented by the designation of a vice-chairman for research.

#### Traffic Engineering Handbook

Progress continues, although slowly, on revision of the Handbook. We have a promise now that this will be ready for the printer by January 1, with actual publication in the spring of 1962.

#### International Relationships

This World Traffic Engineering Conference is a result of increased interest in traffic engineering on a world-wide basis. During the past five years the rate of membership growth has been greater overseas than in the United States. We now have members in 27 countries in addition to the United States and Canada. Canada has increased its membership by large numbers in the past few years and if the membership votes favorably on the increase in number of directors, Canada will soon have representation on the

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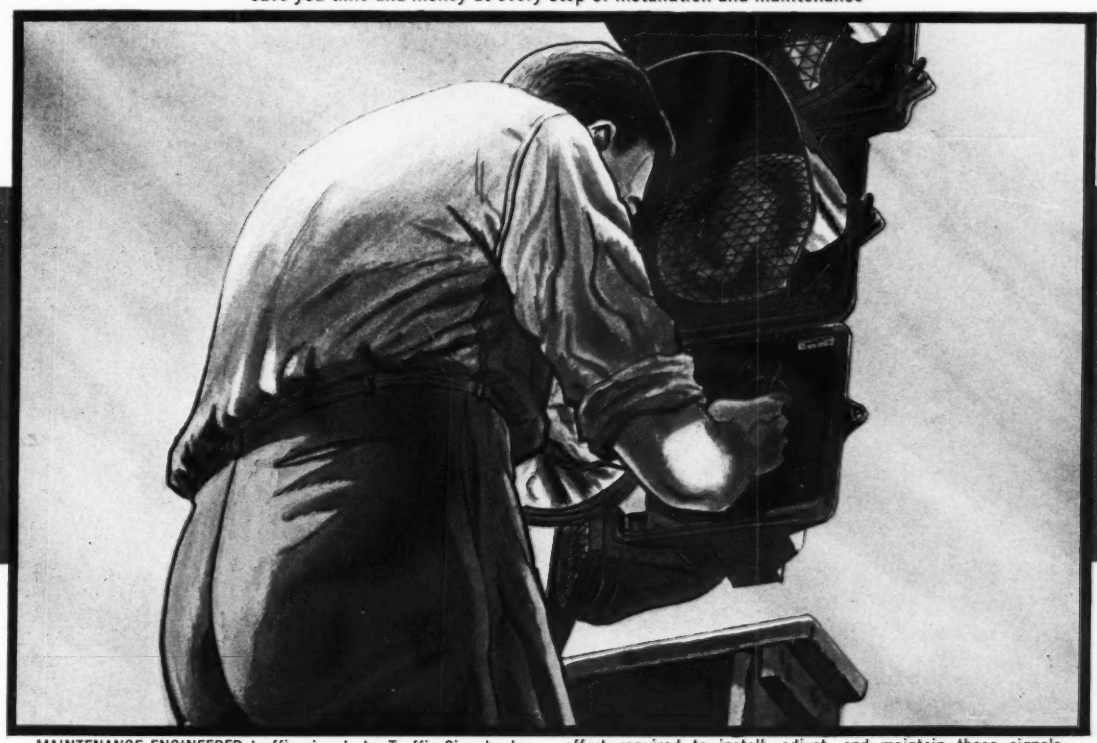

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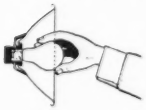

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Board. During this week we hope to establish a Committee on International Relationships which will consider the problems of overseas membership in the Institute. On Saturday we plan an International luncheon where some of these problems can be discussed by the entire group. All ITE members and others interested are invited to attend this luncheon.

### Technical Council

The Technical Council is continuing to improve its operation. I am sure you will agree that the Technical Sessions planned by the various departments here during this Annual Meeting reflect favorably the activity of the Technical Council.

### Technical Development and Research Fund

This fund is now operating with an advisory committee considering applications for funds for use in research. During the year the members were invited to make requests for projects and Mr. Seburn, Chairman of the Advisory Committee, will make a brief report on this matter during this meeting. The first two allocations from the Fund have been approved by the Board—one to Texas A & M and one to California.

### Student Chapters

Students in universities are taking an increased interest in the Institute. Last year student chapters were operating in five schools, Illinois, Northwestern, Purdue, University of Washington and Yale. If the new By-Laws proposed at this meeting are approved by the membership, we believe that student membership will become more popular and more student chapters will be formed.

### Local Sections

Local sections have been extremely active during the past year. Fourteen of the fifteen now established have reported activity of some kind. Specific highlights from some of the Section reports include.

*Midwest Section*—Cash awards for best student papers from two Student Chapters; co-sponsored and furnished speakers for three conferences in the area.

*Metropolitan (NY) Section* — Developed an outstanding organizational pattern within the Section to permit a greatly expanded program overall.

*Southern Section*—Held a successful technical meeting at the Southern Safety Conference, and decided to "go it alone" next year.

*Missouri Valley Section* — Despite a membership spread over a wide area, held five meetings and prepared a fine yearbook for the Section.

*Washington (DC) Section*—Conducted a technical seminar (half-day) with national speakers and large local attendance.

*Canadian Section*—Initiated a successful membership campaign, resulting in nearly 100 members for Canada, compared to 61 in 1960.

*Florida Section*—Put on a conference on operations at the University, and co-sponsored a 37-hour course in signals.

*Indiana Section*—Planned and conducted the traffic meetings at the Purdue Road School.

*Michigan Section*—In addition to holding five successful meetings, the Michigan Section was host to the preview showing of the picture, "Auto USA", and also host to the annual District III meeting.

Other Sections also had profitable years; although details are not now available.

### Finances

Your Secretary-Treasurer furnished each of you with a copy of the financial statement for last year's operations. He has kept a careful watch on the budget for this year and we are all pleased with our financial situation. Mr. Head will report on this later in the meeting.

### Conclusion

During the past year I have followed the example of past President Wetzel in attempting to keep you informed by letters to the membership of the actions of the Board and the management of the Institute affairs. At the last Board meeting we adopted a policy of immediately informing the membership of the Board of action on items of major interest. We intend to continue this so that you will be immediately informed of the actions of your Board of Direction. We believe that this and the publishing of our financial report has resulted in a close relationship between the membership and the officers and members of the Board. I believe the Institute has made progress again this year and I am looking forward with great confidence to the future of this fine organization.

## Annual Report of the Secretary Treasurer

**Institute of Traffic Engineers**
**31st ANNUAL MEETING**
**Sheraton Park Hotel**
**Washington, D. C.**
**August 22, 1961**

Gentlemen, I am privileged to advise you of certain activities of our Institute during the past year that have come under my purview during my term as Secretary-Treasurer.

First, I would like to touch upon our financial condition. You will recall that in May of this year we submitted to all members of the Institute a report on our financial condition for the calendar year 1960. At that time we advised you that we had assets in the amount of $47,784.04 and against this we owed some $6,745.95. We had a net worth of some $41,038.09 which was made up of $8,672.33 in Current Operations, $20,577.88 in the Fee Fund and $11,787.88 in the Technical Development and Research Fund. We also advised you at that time that during 1960 we had an Operating Income of $100,413.55, but that our Operating Expense was $107,665.66 wherein we had an excess of expenses over income of $7,252.11. In 1961 we budgeted an excess of income over expenses sufficient to recoup the deficit incurred in 1960.

This last weekend I reported to the Board of Direction on our financial condition for the first six months of 1961. It appears from this that administratively we have brought ourselves into a solvent area of operation, and when we compare this with the same period in 1960, we find that the total Operating Fund balance is down from last year, but an adequate sum is in the checking account for current expenses. This is not an area of concern.

The Fee Fund continues to build up and has increased in value almost $1,000 in the first six months of 1961. I think it would be of interest to you to know that the Board of Direction has appointed a special committee to study the uses and application of this fund so that it might be used in accord with the intent of our Constitution and By-Laws. The feeling is that this is similar to a capital fund and that it should be reserved for investment purposes so that at sometime in the future, from its earnings, we could support some portion of the operations of the Institute. The board is continuing to

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study this particular fund which has been appreciating quite rapidly over the past five years. As a matter of fact, it has almost doubled in the period from December 31, 1955, (when it amounted to $10,960.07), to December 31, 1960, when it was some $20,577.88.

The Technical Development & Research Fund is up, reflecting contributions without major expenses except for payment of half the salary of the staff engineer. The first allocations from this Fund are just now ready to be made.

When we compare our situation at the end of June, 1961, with June, 1960, we find that our total assets are up 10% from a year ago. Our operations for 1961, based on the first six months, anticipate that our income will be $103,200, expenses will be $99,130. Allowing a surplus of income over expenses of $4,070. This means that this is short of the $7,252.11 deficit of last year by about $3,150, and your Board has taken the necessary action to effect savings in the remainder of this year, and more particularly in the last four issues of Traffic Engineering, so that we will be able to break even at the conclusion of the year.

I think in summary we can all be indebted to our Executive Secretary for managing the affairs of the Institute in accord with the instructions of the Board of Direction in a manner which gives to us a sound, solvent organization on which to build our future growth.

I would like now to touch upon Membership, and in this direction make comparisons with gains and losses over the year in the various areas. They are shown in Table I.

In conclusion it would appear that our financial condition is good, and membership is increasing. The Institute should go forward in these two areas, and I might say it has been indeed a revelation as well as a pleasure to have served you in the position of Secretary-Treasurer this past year. I am looking forward to completing my term of office at the end of this calendar year and turning over to your incoming Secretary-Treasurer a solvent, sound Institute financially, and insofar as its membership records are concerned, a growing Institute.

Respectfully submitted,
J. Al Head, *Secretary-Treasurer*
Institute of Traffic Engineers

TABLE I

Membership — 1960 - 1961

| Grade | Annual Meeting 1960 | Annual Meeting 1961 | Change, 1960-1961 No. | Change, 1960-1961 % |
|---|---|---|---|---|
| Junior Member | 306 | 316 | +10 | + 3% |
| Associate Member | 625 | 700 | +75 | +12% |
| Member | 349 | 369 | +20 | + 6% |
| Affiliate | 53 | 53 | — | — |
| Honorary Member | 5 | 5 | — | — |
| Inactive | 3 | 3 | — | — |
| Totals | 1341 | 1446 | 105 | + 8% |

## Report of the Awards Committee to the Board of Direction

The ITE Awards Committee held a meeting in Washington, D. C. on Sunday afternoon, August 20, 1961, to consider the question of the Institute's support and participation in the Annual Inventory of Traffic Safety Activities, and the giving of awards by the Institute of Traffic Engineers based upon the Traffic Engineering Section of the Annual Inventory.

Present at the Meeting were: Gordon Gravelle; M. V. Greer; (Thomas Young) representing George Howie; Fenton Jordan; C. F. McCormack; Edmund Ricker; Stanley T. Siegel; Wayne Volk.

Absent were: Charles E. Haley; Daniel J. Hanson; Allen R. Pepper.

There were seven voting members present excluding the Chairman. The total Committee consists of ten voting members and the Chairman. Mr. John Baerwald, Chairman of the ITE Inventory Committee, was invited to attend and was present at the meeting.

Based upon a lengthy discussion of the subject, the Committee passed the following motions:

(1). Mr. Siegel moved that the ITE continue to support and participate in the Annual Inventory of Traffic Safety Activities. Seconded by Mr. McCormack.

The motion was approved by a vote of seven (7) in favor and none against.

(2). Mr. Siegel moved that so long as Awards are presented for other Sections of the Inventory, there should be an Award for the Traffic Engineering Section. Seconded by Mr. McCormack.

The motion was approved by a vote of five (5) in favor and two (2) against.

(3). Mr. McCormack moved that the ITE should not make awards in connection with the Annual Inventory of Traffic Safety Activities. Seconded by Mr. Ricker.

The motion was approved by a vote of seven (7) in favor and none against.

A letter dated August 15, 1961 from Mr. Pepper to the Chairman stating Mr. Pepper's position in regard to question before the Committee is filed as a part of this report.

Mr. Volk suggests that the Annual Inventory Committee under the Chairmanship of Mr. Baerwald be strengthened.

All members present felt that the Committee has completed all work assigned.

The Chairman thanked the Committee and recommends that it be discharged.

The Chairman herewith submits this report to the Board for appropriate action.

Respectfully submitted,
Gordon K. Gravelle,
*Chairman*

## Technical Development and Research Fund

### Report to Annual Business Meeting Institute of Traffic Engineers

The amendment to the By-Laws setting up the Technical Development and Research Fund established certain principles, as follows:

"A Technical Development and Research Fund shall be established to promote and support technical research and development of the art and science of traffic engineering. The objective of the Fund shall be to enable the Institute of Traffic Engineers to conduct and coordinate the research and development needed to produce standards, specifications, warrants, recommended practices and other technical aids to the profession."

In all of its work, the committee has sincerely attempted to consider the

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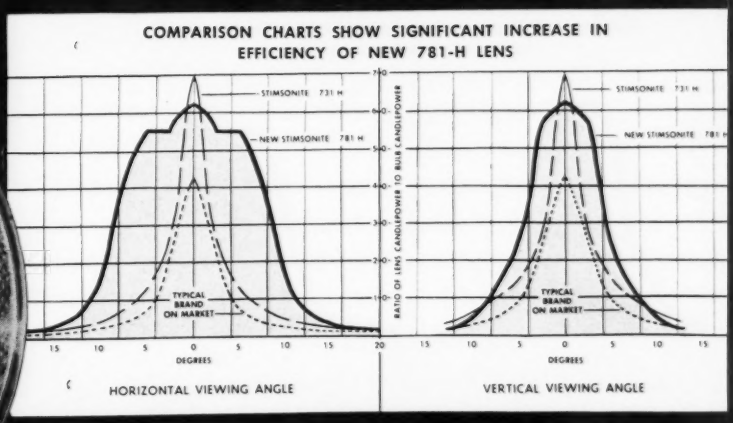
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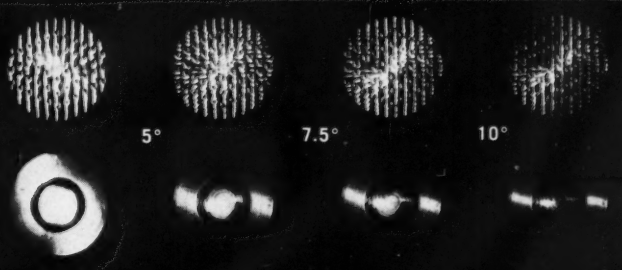


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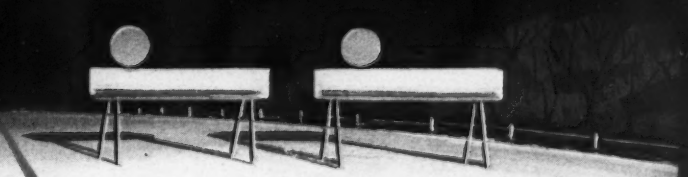

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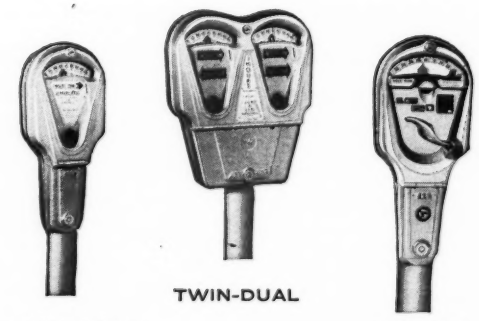
Seattle officials credit the Twin-Dual parking system with speeding traffic flow, by allowing an extra four feet for every motorist to enter or leave a parking space. For a free booklet, write: Dual Parking Meter Company, Subsidiary of Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pa.



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purposes and objectives as indicated in the amendment to the By-Laws.

The committee has had several meetings, and has formulated certain policies for its own guidance, consistent with the stated objectives and principles. A form of request for grant has been developed and has been circulated through various media to members of the Institute.

Since the Fund was established, the committee has received and considered four specific proposals. It has recommended two of these, involving a total expenditure of Institute funds of $6,050. One of these is titled "Effect of Installing Traffic Signals at Intersections on Vehicle Delay." The second is titled "Factual Warrants for Left-Turn Channelization."

Two have been tabled for an opportunity to obtain more information and for the sponsor to substitute a modified proposal that would be more in keeping with the available funds, as well as the principles and objectives upon which the Technical Development Fund is established.

As of June, 1961, when the committee considered and recommended the two projects for Institute financing, there was a total of approximately $12,000 available in the Technical Development and Research Fund for research purposes. In this connection, it must be noted that the Fund provides for certain expenditures in connection with the operation of the Technical Council, as well as for the financing of research. The $12,000 is that portion remaining for research after the other costs are deducted.

The committee has been somewhat disappointed that more traffic engineers have not taken advantage of the opportunity and submitted projects for consideration. This Fund was created in order to help practicing traffic engineers who have much valuable data in their files to make use of such data and conduct research on problems that all are facing every day.

It is also felt that many traffic engineers have actually conducted studies in connection with their regular work and have arrived at conclusions which would be extremely valuable if they were properly disseminated throughout the field. The committee would very seriously consider projects in which an honorarium would be given to such a practicing traffic engineer to enable him to put his study in form for proper distribution.

The committee recognizes that possibly the fault for the lack of projects submitted can partly be laid at its door. In an effort to do a thorough job, we established a form of request that was possibly in much greater detail than would be necessary from the standpoint of a preliminary screening. The form was in such detail that a person that only needed a few hundred, or possibly a thousand dollars, to be able to make a significant contribution hesitated to spend the time in execution of the form for such a small amount.

Consequently, at a meeting in June, 1961, the committee developed a procedure whereby a short form can be submitted for preliminary screening. This would involve merely a brief letter of description covering the following points:

1. What is expected to be accomplished?
2. How will it be of value to the profession?
3. A mention of who will participate in the project with the applicant.
4. A brief statement of the status of the project, if it has already been initiated.
5. Finally, as an aid to the committee in its judgment, a cost estimate would be helpful in three categories: a. Under $500. b. $500 to $2,500. c. Over $2,500.

On receipt of the above project statement, which can probably be handled on a single page, the committee would engage in a preliminary screening, and if the project showed promise, the sponsor would be requested to submit the completed form of request for financial aid. In other words, no sponsor would be required to fill out the complete form until he has had assurance from the committee that his proposal is considered to be basically in harmony with the objectives and principles upon which the Fund is established.

At this point, we would like to emphasize that the committee feels it is highly important for us to get some good projects that would be completed in a relatively short time, hopefully within a year or so. This is extremely important from the standpoint of the Institute being able to demonstrate its stewardship of the Funds made available to the organization. The committee wishes to urge individual members, as well as local sections, to seriously review the potential that they have toward conducting research in the field of traffic engineering. This Fund was created in order to aid our members who are working with problems every day and who have valuable information accumulated over the years which can be applied to certain aspects of our problems, thus making a real contribution to the profession.

This Fund can become the beginning of a major activity of the Institute, or it can lapse for lack of interest. The decision is in the hands of all of us.

Respectfully submitted,

Technical Development and Research Fund Review Committee
T. J. Seburn, *Chairman*

## Technical Council News

### Council Meets During Annual Meeting

The Technical Council met in Washington on August 20. The following brief statements indicate the Council's action on important points of general interest.

1) The Council voted to request the Board of Direction to approve the concept of a change in the chairmanship of the Council. Rather than have the chairmanship change each year as the Vice-Presidents progress up the line of office, the Council would like to appoint a chairman for a three-year term. One vice-president would still attend council meetings to provide liaison with the Board, but he would not be expected to act as chairman. Pending the preparation and adoption of the necessary changes in the Rules of Procedure, the Council recommended that the Board of Direction consider the name of Mr. Carlton C. Robinson to be the first Chairman.

2) Since the area of traffic characteristics is not now provided for within the structure of the Technical Council, permission was requested from the Board of Direction to create Department 8—"Characteristics of Traffic and Traffic Movement."

3) The objectives and scopes of all the departments were reviewed. The revised versions will appear in the 1962 Yearbook.

4) The name of William R. McGrath was submitted to the Board of Direction for approval as the Head of Department 3. A Head for Department 8 and a replacement for Mr. Robinson as Head of Department 2 will be submitted to the Board in January.

5) The need for greater awareness on the part of the membership and increased participation in the technical activities of the Institute was discussed. It is proposed to circulate at least two letters each year, one of which will seek information on current problem areas and the other will inform the members of the projects to be undertaken in the forthcoming year.

6) The Council was informed that the Institute now has a permit from the Library of Congress which allows for borrowing books on "Inter-library Loan" for a period of two weeks.

7) The next meeting of the Council will be held in January before the Highway Research Board meeting. The major item of discussion will be the review of reports submitted by committees.

### New Committees Approved

Four new committees were approved and a fifth was reorganized during the meeting of the Technical Council.

In Department 6, headed by Dr. Donald S. Berry, committee 6A was reorganized with the following objective and scope:

*Committee 6A(61)—Planning Criteria For Traffic Ways.*

OBJECTIVE:

To formulate criteria for developing arterial street plans and related components of urban transportation systems in metropolitan areas.

SCOPE:

To assemble and review criteria used in planning urban transportation systems, formulate a statement of the role of the traffic engineer in system planning, and enumerate the sources of available data in a reference bibliography.

Also approved for committee action in Department 6 were the following two projects:

*Committee 6B(61) — Capacities and Limitations of Urban Transportation Modes*

OBJECTIVE:

To develop a policy statement on the capacities and limitations of the various modes of transportation in metropolitan areas.

SCOPE:

The project is limited to the consideration of urban area transportation modes capable of carrying large numbers of persons across and between areas of the city, including arterial highways, limited access highways, commuter trains, and all forms of rapid transit, including conventional and experimental forms where these seem practical. Air and water travel, moving sidewalks, aerial tramways, and similar, not immediately practical or otherwise limited modes are specifically excluded.

*Committee 6C(61) — Arterial Street Standards as Related to Urban Renewal Projects.*

OBJECTIVE:

To develop criteria for the planning and design of arterial streets as related to urban renewal projects.

SCOPE:

Confining the initial work within the limits of urban renewal projects, the committee will review and analyze the existing criteria applied to the planning and design of arterial streets and formulate new criteria from available research if these are found to be inadequate. If the existing information is incomplete, proposals for additional research will be made.

Mr. Marble Hensley, Head of Department 7, proposed and had approved two new projects as follows:

*Committee 7C(61)—Flashing Electric Lanterns for Barricades*

OBJECTIVE:

To prepare a guide for the purchase of flashing electric lanterns for barricades.

SCOPE:

The committee will derive a performance specification of use to the traffic engineers and the manufacturers of flashing barricade lanterns.

*Committee 7E(61) — Traffic Signal Heads*

OBJECTIVE:

To prepare a guide for the purchase of adjustable face traffic control signal heads.

SCOPE:

The committee will revise existing Technical Report No. 1 and prepare a new specification of use to the traffic engineer and traffic signal head manufacturers which covers both 8" and 12" traffic signal heads.

## Section News

### CANADIAN SECTION

New officers for 1961-62 are:

President, R. J. Desjardins; Vice President, R. D. Cowley; Secretary-Treasurer, Grant A. Bacchus, 179 Tavistock Road, Downsview, Ontario; Eastern Director, M. T. M. Nielsen; Central Director, J. L. Vardon; Western Director, G. N. Worsley.

### NEW ENGLAND SECTION

New officers for 1961-62 are:

President, Bernard B. Twombly; Vice President, Burton M. Rudy; Secretary-Treasurer, Philip S. Mancini, c/o State Dept. of Public Works, 245 State Office Building, Providence, Rhode Island.

## Membership Applications

**The Institute of Traffic Engineers welcomes applications from qualified traffic engineers, but does not desire as members persons who are unqualified. Listed below are the names of those from whom applications for membership or transfer in grade have been received since the last published list. Institute members are urged to review this as soon as possible and immediately inform the Executive Secretary's office if names of people are found who are known to be unqualified for ITE membership or transfer.**

### New Applications

**CROCKER, William H.**
City Electrician, Cambridge, Massachusetts—for MEMBER.

**NUNN, John Curtis**
Assistant Planning Traffic Engineer, Bureau of Traffic Engineers, City of Philadelphia, Pennsylvania—for ASSOCIATE.

**MacMONIGLE, Robert Arthur**
Assistant Traffic Planning Engineer, City of White Plains, New York—for JUNIOR.

**RODRIGUEZ, Luis G.**
Chief Traffic Division, Department of Public Works, Municipality of San Juan, Puerto Rico—for ASSOCIATE.

**SCRUGGS, William C.**
Highway Design Engineer, Arlington County Highway Division, Arlington, Virginia—for JUNIOR.

**THWAITES, Douglas Herbert Cody**
Operations & Planning Engineer, Traffic Department, City of Hamilton, Ontario, Canada—for JUNIOR.

**YARBOROUGH, Vivvien Lee**
Engineer II, Public Works Department, Major City Street Section, San Jose, California—for JUNIOR.

### Application for Transfer

**MacNAUGHTON, Kevin A.**
Traffic Engineer, City of Kettering, Ohio—for ASSOCIATE.

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- Open-book controllers easily accessible and expandable for modifications, inspection, etc.
- Minor-movement timers eliminated; no parent-phase limitations.
- Right-of-way transfers from one phase to any other as traffic demands, skipping those phases with no demand.
- Left turns possible in both directions... starting separately, following or overlapping part or all of the other's timing.
- Right-of-way can be transferred from either or both left turns to cross traffic, skipping former straight-through phase.
- Right-of-way remains with approach having last vehicle call, including either or both left-turn phases. Timed maximum begins upon demand from intersecting lanes.
- Built-in timed overlaps permit both straight-through and left-turn signals on single-direction routes.
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- Straight-through signals remain "on" for timed maximum if there are no gaps in traffic flow, or switch to other lanes when gaps appear.

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**MANUFACTURING LICENSEE:** Peterco, Sao Paulo, Brazil

# New Members and Transfers

**Approved by the Board of Direction, August 19, 1961**

### TRANSFERS FROM JUNIOR TO ASSOCIATE

**BARTLE, Richard Milne**
Municipal Financing Consultant, Stone & Youngberg, San Francisco, California.

**BIDELL, William**
Construction Engineer, Toronto, District, Ontario Department of Highways, Downsview, Ontario, Canada.

**BLINDAUER, Harlan Healy**
Project & Traffic Engineer, Meissner Engineer, Inc., Reno, Nevada.

**COCHARO, Sam L.**
Traffic & Planning Engineer, City of Pueblo, Colorado.

**COCHRAN, George Alton**
Senior Traffic Analyst, Traffic & Planning Section, Louisiana Department of Highways, Baton Rouge, Louisiana.

**CORBETT, Bernard Augustus, Jr.**
Assistant Traffic Engineer, City of Charlotte, North Carolina.

**CRAWFORD, George LeRoy, Jr.**
Traffic Field Engineer, Illinois Division of Highways, East St. Louis, Illinois.

**DANIELS, Jack A.**
Engineer II (traffic), Traffic Engineering Department, City of Fort Worth, Texas.

**DeARMON, Charles W.**
Traffic Planning Engineer, City of Dayton, Ohio.

**DRAKE, Gerard Lloyd**
Principal Associate, Wilbur Smith & Associates, Columbia, South Carolina.

**FREED, Arthur**
Traffic Engineer, County of Westchester, White Plains, New York.

**GILBERT, Alton Keith**
Transportation Planning Engineer, Transportation & Traffic Engineering Division, City of San Diego, California.

**GILET, Jean-Louis A.**
Traffic Engineer—Marketing Department, Societe des Petroles Shell Berre, Paris, France.

**GRIMM, Vincent Earl, Jr.**
Engineer of Design, City of Miami, Florida.

**GUYTON, Joseph Warren**
Transportation & Traffic Engineer, Harland Batholomew & Associates, Memphis, Tennessee.

**HIGGS, Robert Wilson**
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